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1 OF 2

CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC

INFORMATION REPORT

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PLEASE NOTE

This report presents unevaluated information extracted from recently received publications of the USSR. The information selected is intended to indicate current scientific developments and activities and is disseminated as an aid to research in the United States.

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I. BIOLOGY

Genetics

1. Philosophical Approach to Genetics

"Philosophical Problems of Genetics," by V. Kaganov, Institute
of Philosophy; Moscow, Meditsinskiy Rabotnik, 23 Aug 60, p 3

The author introduces this discussion with the statement that the
study of genetics, herein defined as the law of heredity and its modifia-
bility, is faced with the resolution of a number of complex problems with
biological and philosphical-theoretical significance. He cites the
questions of whether there exists in the body a "substance of heredity"
independent of the body and its living conditions or whether heredity is
one of the fundamental properties of the entire living body; what the
determining factors of hereditary mutations are and whether they are
within the organism or in its environment; and whether characteristics
are acquired due to the effect of environmental changes.

These questions form the basis of the ideological conflict between
the Michurinist and the Weisman-Mendel-Morgan concepts of heredity.
Soviet scientists, the author continues, are united in opposition to the
idealistic philosophy, although some still do not thoroughly comprehend
the idealistic elements of these concepts, particularly the gene theory.
The Lenin philosophy is offered as the only prospective resolution.

The author reiterates the gene theory briefly, quotes some of its
proponents, and notes its fallacies. Certain proponents of the gene
theory, notably N. P. Dubinin, have recently found it "necessary to
reject some points of the autogenetic theory and to recognize the principal
dependance   of the nature of mutations on the nature of the conditions
acting" upon them. Various qualifications of this viewpoint are noted.
The Michurin theory states that there is a "substance of heredity in the
body, not independent of it; heredity is a property of the entire living
body; the conditions under which organic forms live play a large part in
the genesis of hereditary changes." The author further asserts that in
all cases of the emergence of new organic forms by directed training of
organisms under suitable environmental conditions, the hereditary changes
observed had not a casual, but a regular, stable character: they were
consecutively repeated, reproduced in the progeny of the altered organism.
T. D. Lysenko's conclusion that a hereditary change in a living body is
attributable to the action of the environmental conditions if these con-
ditions are assimilated by the living body is mentioned.

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According to this article, the control of heredity is possible only on the basis of regular, adequate modification, when the investigator is firmly convinced that definite hereditary changes can be produced by creating suitable conditions; not only Michurinist genetics, but the latest achievements of all allied branches of experimental biology, verify this premise. The most direct pathway to objective truth, as defined by Lenin, in the field of genetics is Michurinist science rigidly connected with and substantiated by selection-genetic practice. New experimental biological data, particularly concerning the connection of hereditary phenomena with the presence of DNA and other nucleic acids in the cells, attest to this position. These "new data" are, in the author's opinion, achievements of biochemistry and microbiology; they have been obtained in experiments on the transformation of bacteria, and not only have nothing in common with the gene theory, but also explode the notions that hereditary phenomena can occur independent of environmental influences and that directed changes cannot be obtained. Transformation, the transmission of characteristics from one variant to another with the aid of DNA, is rigid and regular, but not casual, and thus cannot serve to verify the gene theory.

The article concludes with the following paragraph:

"In his remarkable speech at the June plenum of the Central Committee of the CPSU, N. S. Khrushchev, referring to the role of science in creating the material-technical base for Communism, noted in particular that the decisive factor between the two trends in contemporary genetics is 'practice, life. But practice speaks in defense of the biological school of Michurin.'"

Marine Biology

2. ### Ultrasound Effects on Various Marine Organisms

"Live Components of Water and Ultrasound," by Marczed Edward and Mazur Zygmunt, Gaz. Woda i Techn. Sanit. (Journal of Water and Sanitation), Vol 33, No 2, 1959, pp 54-55 (from Referativnyy Zhurnal -- Biologiya, No 14, 25 Jul 60, Abstract No 64270, by L. Braginskiy)

"Tests were run on the degree of resistance of organisms to ultrasound and on maximum fluctuation frequencies which are tolerated by various species. Organisms most sensitive to the effect of ultrasound proved to be infusoria, copepodas, and the larvae of trematodes; and among the nonplankton forms, the most sensitive to ultrasound were caddis flies, the tendipedidae, oligochaeta, and certain nematodes and sponges."

Radiobiology

3. ## ACTH Content of Adenohypophysis Decreases Three Hours Post Irradiation

    "Adrenocorticotrophic Hormone (ACTH) Content of the Adenohypophyses
    of Control and Irradiated Rats," by M. A. Larina, Radiation Labora-
    tory, All-Union Institute of Experimental Endocrinology; Moscow,
    Problemy Endokrinologii i Gormonoterapii, Vol 6, No 3, May/Jun 60,
    pp 18-21

    The purpose of the research described was to study the ACTH content of
    the hypophysis in rats 3 hours after whole-body irradiation by minimum
    certain lethal doses (newly born rats subjected to 700 r).

    Results show that the weight of the rat hypophysis 3 hours after
    irradiation by minimum certain lethal X-ray doses did not differ from the
    hypophysis weight of the controls; however, the ACTH content of the anterior
    lobe of the hypophysis of irradiated rats was slightly less than the ACTH
    content in the normal animals.

4. ## ACTH Fluctuations in Peripheral Blood Following X-Irradiation

    "The Effect of Ionizing Radiation on Adrenocorticotrophic Activity
    of the Peripheral Blood," by E. R. Bagramyan, Radiation Laboratory,
    All-Union Institute of Experimental Endocrinology; Moscow, Problemy
    Endokrinologii i Gormonoterapii, Vol 6, No 3, May/Jun 60, pp 27-31

    The purpose of the research described was to study the adrenocortico-
    trophic activity of the peripheral blood of rats subjected to X-irradiation.

    The method of cross-circulation of blood as described by Brodish
    and Long was used to determine the ACTH activity and ascorbic acid level
    in the peripheral blood of hypophysectomized and intact animals.

    Results show that the ascorbic acid content was diminished in the
    hypophysectomized side of unirradiated rats by 12.8%. Acute blood loss
    or nerve stimulation by an electric current were accompanied by an increase
    in ACTH activity of the peripheral blood. Three hours after irradiation,
    the blood ACTH activity sharply decreased, and 5 hours postirradiation,
    almost no ACTH could be detected in the peripheral blood.

5. Hypophysectomy and Adrenalectomy Lower Blood Pressure of Irradiated Animals

"The Role of the Hypohysis and Adrenals in Regulating Systolic Blood Pressure of Irradiated Rats," by A. A. Grafov; Moscow, Problemy Endokrinologii i Gormonoterapii, Vol 6, No 3, May/June 60, pp 22-26

Tests were conducted on rats subjected to whole-body X-irradiation by 100, 300, and 600 r to determine the role of the hypophysis and the adrenal glands in the development of radiation hypotension.

Results show the following:

1. The hormones of the hypophysis and the adrenals take part in regulating blood pressure, not only under normal conditions, but also after irradiation. Against a background of radiation sickness, a blood pressure decline is sharper due to the absence of the regulating influence exerted by these glands.

2. The degree of blood pressure fall in hypophysectomized rats irradiated by 100 r corresponded, essentially, with the degree of blood pressure fall in unoperated rats irradiated by 600 r doses.

3. In the adrenalectomized rats irradiated by 100 r, the blood pressure fall corresponded to that observed in the unoperated animals irradiated by 600 r.

4. The value of the systolic pressure change is proportional to the general radioresistance, which decreases sharply in hypophysectomized and adrenalectomized animals.

6. Threshold Determinations of Radioactive Sodium Administered Internally

"The Reactions of the Adrenal Medulla to the Effect of Small Doses of Ionizing Radiations Administered Internally to Organisms," by V. I. Kandror, Laboratory of Radiobiology, Scientific Research Institute of Sanitation and Hygiene; Moscow, Fiziologicheskiy Zhurnal SSSR imeni I. M. Sechenova, Vol 46, No 6, Jun 60, pp 744-749

The purpose of the research described was to study the reactions of the chromaffin tissue to the action of small doses of radiation introduced internally: the author considers the establishment of threshold concentrations of internally administered radioactive substances very important. Tests were conducted on rabbits to which radioactive sodium was administered in the form of $Na^{24}CO_3$ in 1-1.5 ml amounts.

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Results are summarized as follows:

1. The administration of radioactive sodium (Na^{24}) in concentrations of 0.25 microcurie per 3 kg body weight to rabbits increases the activity of the adrenal medulla. The increased adrenalin elaboration continues for one week. The administration of one microcurie of Na^{24} per 3 kg body weight causes a rise in the concentration of adrenalinlike substances in the blood following a significant temporary fall. Changes are evident for a week after the injection of the radioactive isotope. The administration of 5 microcuries of Na^{24} per 3 kg body weight leads to a biphasic stimulation of the chromaffin tissue activity during which time the second wave of concentration of adrenalin substances in the blood attains a very high peak. Normalization in this case was noted toward the end of the second week and the beginning of the third week.

2. The dynamics of the adrenalin incretion is a sensitive test in determining the threshold concentration of radioactive substances that enter an organism.

3. The dose of irradiation determines the nature, the degree, and the duration of changes in the adrenal medulla.

7. Participation of Embryo Endocrine Glands in Protective-Compensatory Reactions Against X-Irradiation

"The Condition of Certain Endocrine Glands in Progeny of Animals Which Were Subjected to X-Irradiation During Pregnancy," by T. G. Sofiyenko, A. N. Yakovleva, and V. M. Bayrachnyy, Fiziol. Osobennosti Detsk Vozrasta i Vopr. Profilaktiki Zabolevanyy (Physiological Characteristics of Child Growth and the Problem of the Prophylaxis of Diseases), Khar'kov, 1959, pp 279-301 (from Referativnyy Zhurnal -- Biologiya, No 14, 25 Jul 60, Abstract No 68096, by V. Semagin)

"Rats were subjected to X-irradiation by 200-900 r 2 to 9 days prior to the termination of pregnancy. The structural and functional changes which were evident in the adrenals, thymus, and thyroid glands in the embryos depended on the dose and on the time of birth after irradiation. In the animals which were born during the first 3 days after irradiation by 400-900 r, activation of the adrenals and of the thymus gland was evident, in addition to the pathological changes in the endocrine organs, which substantiates the increase of the protective-compensatory reactions. In the animals born during the fourth to fifth day after irradiation, the function of the adrenals was sharply depressed, and radiation sickness was evident. In the animals born during the sixth to ninth day after

irradiation, the activation of the adrenals was evident in certain cases. The longer the period before birth after irradiation, the closer to normal the structure of the thymus gland. Increased function of the thyroid gland was always linked to decreased function of the adrenal cortex. The endocrine glands of the embryo participate in protective-compensatory reactions."

8. **Effects of X-Irradiation on Cholinesterase Activity Investigated**

"The Effect of X-Irradiation on Cholinesterase," by M. M. Lenkevich, Tr. In-ta, Eksperim. Med. AMN SSSR za 1958 g. (Works of the Institute of Experimental Medicine, Academy of Medical Sciences USSR, During 1958), Leningrad, 1959, pp 437-442 (from Referativnly Zhurnal Khimiya -- Biologiche-skaya Khimiya, No 14, 25 Jul 60, Abstract No 19444, p 33, by C. Krivobokova)

"The effect of X-irradiation on mouse blood cholinesterase under standard conditions of irradiation (180 kv., 15 ma., 39.8 r/min., total dose of 600, 700, and 800 r) was investigated. It was determined that with a dose of 600 r, a depression in cholinesterase activity occurs within 1-2 hrs, and after 4 hrs reaches 48.5%. The activity of the enzyme is almost completely restored within 24 hrs (up to 92.3% after the third day of irradiation), but then there is another decrease in the enzyme activity which can be controlled depending on the appearance of toxic substances. The recovery of the animals was accompanied by the restoration of enzyme activity. Increasing the dose to 700-800 r led to a decrease in cholinesterase activity during which the sharpest decrease in activity coincided with the days on which the greatest number of animals died. It is thought that the mechanism of cholinesterase inhibition is dependent on the interaction of peroxide, free radicals, and other toxic products with the esterase portion of the protein complex."

9. **Radiation Effects on Potato Vulnerability to Fungi**

"The Effect of Ionizing Radiation on the Resistance of Potato Tubers to Fungi," by Ye. N. Mukhin, Dokl. VASKhNIL (Reports of the All-Union Academy of Agricultural Sciences imeni Lenin, No 9, 1959 pp 14-17 (from Referativnyy Zhurnal -- Biologiya, No 14, 25 Jul 60, Abstract No 65513, by M. Parfutina)

"At the Institute of Biochemistry, Academy of Sciences USSR, the tubers of the Lorkh Potato variety were subjected to irradiation by doses of 10,000 r from Co^{60} at 630 r/min during various storage periods. Slices of tubers were inoculated with a monosporic culture of Fusarium fungi.

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Species of Fusarium which cause dry potato rot were able to penetrate into the tissue tubers only through the unhealed cut areas. The intensity of peroxidase formation and the ascorbic acid content were identical in the slices of both the experimental and control tubers; 48 hours after the inoculation at 20° C, a continuous layer of cells impregnated with suberin was formed in all the samples. The process of regeneration of the cut periderm in the irradiated tubers was significantly depressed. At a temperature of 4° C the cut periderm did not regenerate in any of the samples, and the deposition of suberin was grossly retarded and irregular; therefore, after inoculation of the slices by the mycelium Fusarium, the fungi spread much faster in the irradiated tubers. The shorter the period from the time of irradiation to the infliction of injury, the greater was the damage inflicted on the irradiated tubers by the dry potato rot. Doses of 5,000 r resulted in less damage by fusariosis than doses of 10,000 r. Increasing the magnitude of the source from 630 r to 5,000 r accelerated the germination period of potatoes by 17-30 days (after transplantation)."

CPYRGHT

10. Factors Affecting Cesium-137/Potassium Ratio in Various Crops

"The Ratio of Cesium-137 to Potassium in the Soil and Plants," by Prof I.V. Gulyakin, Ye. V. Yudintsev, and E. M. Levina; Moscow, Izvestiya Timiryazevskov Sel'skokhozyaystvennoy Akademii, Vol 34, No 3, May/Jun 60, pp 18-29

Next to radiostrontium, cesium-137 is the most dangerous radioactive contaminant of the atmosphere and the ground surface. By falling onto the soil, water, and plants, it is picked up by various organisms and enters into the biological cycle of metabolized substances and gains entrance into the human organism when accompanied by potassium.

The article described is a study of the various factors (potassium concentration in the soil, the ratio of cesium-137 to potassium, pH of the soil, type of soil, etc.) which modify the ratio of cesium-137 to potassium in various plants (clover, wheat, peas, beets, straw). Eleven tables give further details.

The authors present the following conclusions:

1. The ratio of cesium-137 and of potassium in the crops depends more on the entrance of radiocesium from the soil into the plants than on the movement of potassium in the same direction.

2. Under identical levels of contamination, a known ratio between radiocesium and potassium can be observed as they enter from the soil into various plants.

CPYRGHT

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3. With an identical coefficient of discrimination, the quantity of cesium-137 can differ greatly in crops due to the ratio of cesium to potassium during their movement from the soil to the plants.

11. Toxic Effect of Gamma-Irradiation in the Oxidation of Fish Oils

"Concerning the Specific Action of Radiation During the Process of the Formation of Toxic Substances in Fats," by Ye. B. Burlakova, B. G. Dzantiyev, G. B. Sergeyev, and N. M. Emanuel', Nauchn. Dokl. Vyssh. Shkoly Biol. N., (Scientific Reports of Higher Schools. Biological Sciences), 1960, No 1, pp 145-147 (from Referativnyy Zhurnal. -- Khimiya -- Biologicheskaya Khimiya, No 16, 25 Aug 60, Abstract No 23406, by V. Barun)

"Fish oils were subjected to gamma-irradiation from Co^{60} (150,000 r), then were oxidized in air at a temperature of 65-120° C in an oxidizing compartment. During the course of oxidation, samples were taken and tested to determine their toxicity. It was established that the unoxidized oils, both irradiated and unirradiated, did not exert a toxic effect on the hydra and lupine rootlets; however, the oxidized irradiated and unirradiated oils did exert an acute toxic effect. No difference in toxicity was observed in irradiated and unirradiated oils oxidized to an identical extent. The toxic substance of oils is highly water soluble. After washing the toxic substance with water, the oxidized oil becomes nontoxic. The toxicity of the oxidized oil is due to the formation of acids. Even an insignificant amount of acids delays the growth of lupine rootlets. The acids to which toxicity is linked are secondary products of the process of oxidation and appear at later stages of fat oxidation. The authors consider that the stimulating action of irradiation on the formation of toxic substances is due to the disturbed mechanism of the action of intrinsic antioxidizing agents."

Analytical

12. Colorimetric Determination of Rhenium in the Presence of Molybdenum

"Concerning the Colorimetric Determination of Rhenium in the Presence of Molybdenum; Part II," by V. M. Tarayan and L. G. Mushegyan, Institute of Geological Sciences, Academy of Sciences Armenian SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR -- Khimicheskiye Nauki, Vol 12, No 6, Mar 60, pp 407-411

A modified procedure for the preliminary separation of rhenium from molybdenum has been worked out in connection with which ascorbic acid is used as a reducing agent. It was established that rhenium is not reduced by ascorbic acid if the concentration of the sulfuric acid that is present does not exceed 3 N.

Electrochemistry

13. Application of the Method of Radioactive Tracers in the Investigation of the Electrolytic Deposition of Titanium-Cobalt Alloys

"Application of the Method of Radioactive Tracers in the Investigation of Conditions Under Which a Titanium Cobalt Alloy Forms as a Result of Electrolytic Deposition," by S. M. Kochergin and G. R. Pobedimskiy, Chair of Physical Chemistry, Kazan' Chemico-Technological Institute imeni S. M. Kirov; Ivanovo, Izvestiya Vysshikh Uchevnykh Zavedeniy SSSR -- Khimiya i Khimicheskaya Tekhnologiya, Vol 3, No 3, Jun 60, pp 457-460

The method of radioactive tracers was used to investigate the effect of the conditions under which a titanium-cobalt alloy is deposited electrolytically on the composition of the alloy and the uniformity of the distribution of cobalt in the electrolytic deposit. It was found that the cobalt content diminishes in the deposit with increasing cathodic current density and increases with increased temperatures of the cell and an increased relative content of cobalt in the electrolyte. The uniformity of the distribution of cobalt in the electrolytic deposit increases with increased cathodic density of the current, with increased temperatures of the cell, and with an increased relative content of cobalt in the electrolyte. Application of the method of radioactive tracers in the investigation

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of electrolytic deposition of alloys make it possible to determine more precisely and rapidly the content of individual components in a great number of samples in such a manner that the samples are not subjected to decomposition and can be used in subsequent tests.

14. Electrolytic Production of a Highly Disperse Iron Powder

"Electrolytic Preparation of a Highly Disperse Iron Powder," by N. T. Kudryavtsev and N. I. Mikhaylov; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 6, Jun 60, pp 1360-1365

Different compositions of the electrolyte for the preparation of a highly disperse iron powder by electrolysis were tried. It was found that the best electrolyte is an aqueous solution saturated with ferrous sulfate and potassium sulfate. This electrolyte had been proposed by N. T . Kudryavtsev and N. T. Tereshkovich earlier. The optimum conditions for the production of iron powder from an electrolyte solution of the composition indicated were investigated. Iron powder is used for the production by powder metallurgy methods of cores of spools, parts of radio equipment, magnetic alloys, self-lubricating friction bearings, hard alloys for cutting tools, etc. Fine iron powder is also used as a catalyst in the chemical industry and for the cementation of copper in the electrolytic refining of metals. It was established that addition to polyesterurethane resin of iron powder prepared by the method described increases the heat resistance of the resin by a factor of approximately 2.

Fuels and Propellants

15. Intramolecular Combustion of Ammonium Salts

"Capacity of Inorganic Ammonium Salts for Intramolecular Combustion," by A. A. Shidlovskiy, Chair of General and Organic Chemistry, Moscow Institute of Chemical Machine Building; Ivanovo, Izvestiya Vysshikh Uchebnykh Zavedeniy SSSR -- Khimiya i Khimicheskaya Tekhnologiya, Vol 3, No 3. Jun 60, pp 404-407

Investigation of the combustion of NH_4NO_3, NH_4ClO_4, NH_4IO_3, and $(NH_4)_2CrO_4$ at high pressures in a manometric bomb established that the first three salts listed undergo complete combustion and are, therefore, capable of stable intramolecular burning. On the other hand, ammonium chromate, the decomposition of which raises the temperature to a lesser extent than that of the other salts mentioned (not above 300°), undergoes

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only partial combustion. It was found that when 10% of manganese dioxide, 5% of cuprous chloride, or 5% of cupric chloride dihydrate are added to ammonium perchlorate, they exert a catalytic effect, so that ammonium perchlorate becomes capable of sustained intramolecular combustion at atmospheric pressure. The data on the heats of formation of a number of inorganic ammonium salts that are capable of exothermic decomposition have been arranged in a systematic manner. The heats of decomposition of the salts have been calculated.

16. Inhibitors of the Thermal Decomposition of Ammonium Nitrate

"An Expedient Selection of Inhibitors of the Thermal Decomposition of Ammonium Nitrate," by B. Yu. Rozman; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 6, Jun 60, pp 1258-1263

As a result of an investigation of the thermal decomposition of ammonium nitrate, it was established that this decomposition is of the autocatalytic type in its initial stage. In the initial stage, ammonium nitrate is subjected to acidic hydrolysis, a process which has auto-catalytic characteristics and leads to the formation of ammonia and nitric acid. Subsequently, as a result of the interaction of ammonia with nitrogen dioxide that forms because of the thermal decomposition of nitric acid, secondary products of decomposition are formed. Consequently, an inhibitor of the decomposition must suppress the autocatalytic process. This can be achieved either by the binding of the free nitric acid that forms as a result of hydrolysis or the binding of nitrogen dioxide that forms as a result of the thermal decomposition of nitric acid.

It was established that the most effective inhibitors of the thermal decomposition of ammonium nitrate are substances which exert a buffer action, namely, amino-compounds that hydrolyze easily with the formation of ammonia (e.g., urea, guanidine, etc.) or polyamminozinconitrates.

The inhibitors with a buffer action do not have high thermal stability themselves. However, in some cases, their stability is increased by mixing them with ammonium nitrate. For instance, investigation of thermal stability in the system ammonium nitrate-urea established that the urea which stabilizes the ammonium nitrate is, in turn, stabilized itself by the ammonium nitrate.

Comparison of the action of buffer inhibitors with the action of inhibitors used for the stabilization of some nitric acid esters leads to the following conclusions. The most important inhibitors (stabilizers) of nitric acid esters are diphenylamine and the alkyl- and aryl-substituted derivatives of urea (centralites). The action of these inhibitors consists in the binding of nitrogen oxides. During the storage of nitric acid

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esters, nitrogen oxides are formed principally as a result of secondary reactions brought about by the nitric acid which is formed in consequence of the primary reaction of hydrolysis of the nitric acid ester. Neither diphenylamine nor centralites exert any significant effect on the primary reaction of hydrolysis. As distinguished from diphenylamine and centralites, the inhibitors with a buffer effect that have been investigated in this instance inhibit the primary reaction of hydrolysis. Furthermore, they are capable of eliminating nitrogen oxides if these oxides are formed. For this reason, the effect exerted by inhibitors with a buffer action must be considerably greater than that produced by inhibitors which are capable of binging nitrogen oxides, but not of inhibiting hydrolysis.

17. Formation of Hydrogen Bonds Between Peroxide Radicals and Molecules With Hydroxyl Groups

"Concerning the Possibility of the Formation of Hydrogen Bonds Between Peroxide Radicals and Molecules With Hydroxyl Groups," by Ye. T. Denisov, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Izvestiya Akademiya Nauk SSSR-Otdeleniye Khimicheskikh Nauk, No 1, Jan 60 /publication delayed/, pp 53-58

It is brought out that there is a possibility of the formation of hydrogen bonds between peroxide radicals and molecules with hydroxyl groups. Formation of such bonds during oxidation reactions must reduce the velocity of chain propagation. On the example of the oxidation of cyclohexanone, it was established by the method of inhibition during the course of the reaction that there is a decelerating effect of water on the reaction of chain propagation. This confirms that there is formation of a hydrogen bond with the radical in this system.

18. Spectroscopic Investigation of the State of a Gas Behind a Shock Wave

"Spectroscopic Investigation of the State of a Gas Behind a Shock Wave; Part III," by F. S. Fayzullov, N. N. Sobolev, and Ye. M. Kudryavtsev; Moscow, Optika i Spektroskopiya, Vol 8, No 6, Jun 60, pp 760-768

By using the generalized method of the reversal of spectral lines, the temperatures of nitrogen and air behind a shock wave were measured in the range of changes of the velocity of the shock wave from 1.9 to 4.3 kms per second and a pressure of the gas in the stopper amounting to 0.1-4 atmospheres. It was established that there is satisfactory agreement between the experimentally measured and theoretical dependences of the temperature of the stopper on the velocity of the shock wave. The distribution of the temperature along the stopper was determined at different velocities of the shock wave.

The authors thank A. V. Potapov and S. S. Semenov for discussing the work described by them and giving valuable advice in connection with this work. They give credit to Ye. T. Antropov and A. A. Sapronov for assistance in constructing the equipment that was used.

19. Combustion in a Turbulent Stream

"Combustion of Gasoline-Air Mixtures in a Turbulent Stream," by L. S. Kozachenko, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR-Otdeleniye Khimicheskikh Nauk, No 1, Jan 60 /publication delayed7, pp 45-52

It was found that when the total turbulence caused by an isothermal oncoming stream, on the one hand, and generated by the flame, on the other hand, is considered, the experimental data agree fairly closely with the theoretical results. This finding confirms the correctness of G. Damkahler's and Shchelkin's ideas concerning the propagation of a flame in a turbulent stream by both the pulsations of the stream and the normal velocity of the propagation of the flame. The direct dependence of the turbulence generated by the stream on the normal velocity of combustion increases the role played by the latter in the transmission of the flame in a turbulent stream. The turbulent velocity of the propagation of flame is determined by the maximum velocity of flame foci with respect to the combustible mixture. The foci, moving in a direction opposite to that of the fresh combustible mixture and impinging on the latter, form the advancing front of the flame. These foci act as sources of ignition and bring about final combustion of the mixture in the combustion zone extending over a flame surface that is distorted by pulsations.

20. Detection of Hydrogen Atoms in Flames by the Electronic Paramagnetic Resonance Method

"Detection of Hydrogen Atoms in Rarified Hydrogen Flames by the Electronic Paramagnetic Resonance Method," by V. N. Panfilov, Yu. D. Tsvetkov, and V. V. Voyevodskiy, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Kinetika i Kataliz, Vol 1, No 2, Jul/Aug 60, p 233

V. N. Kondrat'yev and Ye. I. Kondrat'yeva established by the calorimetric method that concentrations of hydrogen atoms exceeding that which corresponds to equilibrium conditions are present in rarified hydrogen flames (Zhurnal Fizicheskoy Khimii, Vol 20, 1946, p 1239). In the work described at present, the electronic paramagnetic resonance method was used to detect hydrogen atoms in the rarified flame zone. Investigation of the combustion of a hydrogen-oxygen mixture was carried out in a

region located slightly above the lower limit of ignition. At pressures of 3-20 mm Hg and a velocity of the gas stream in the range of 10-20 meters per second, an electronic paramagnetic signal corresponding to hydrogen atoms was recorded which represented a doublet with a g-factor of ~ 2 and splitting over a region of ~ 500 Oersted. It was found that the intensity of the signal shows a strong dependence on the gas pressure, apparently because this pressure affects the rate of gas flow. It was also found that at a pressure of 8 mm, the amplitude of the signal increases with increasing concentrations of hydrogen in the mixture.

At present, experiments are being conducted to determine the quantitative aspects of the dependence of the concentration of hydrogen atoms on the temperature, pressure, and composition of the mixture. Work is also being continued with the view of establishing the presence of other atoms and radicals which may be expected to form in the course of the reaction being investigated.

21. Thermochemical Gas Analyzer for the Continuous Determination of Oxygen

"A Thermochemical Gas Analyzer for the Continuous Determination of Oxygen," by G. P. Tsyplyatnikov and V. B. Aleskovskiy, Chair of Analytical Chemistry, Leningrad Technological Institute imeni Lensovet; Ivanovo, Izvestiya Vysshikh Uchebnykh Zavedeny SSSR-Khimiya i Khimicheskaya Tekhnologiya, Vol 3, No 3, Jun 60, pp 550-559

An operating model of a thermochemical gas analyzer for the continuous determination of oxygen in gas mixtures containing up to 10% of oxygen was constructed and tested under laboratory conditions. Its operation is based on measurements of the electromotive force developed by a platinum/platinum-iridium thermocouple at which flameless combustion of hydrogen that is added takes place at a temperature of 250-300°. The hydrogen uses up the oxygen in the gas being analyzed. The electromotive force developed by the thermocouple depends on the oxygen concentration. The results of the investigation made it possible to develop an automatic gas analyzer for the continuous determination of oxygen directly in a stream of hot gas. The method is applicable for the determination of oxygen in mixtures with noncombustible gases and vapors. It can be modified in such a manner that it will become suitable for the determination of oxygen in some combustible gases by a procedure not requiring the use of hydrogen.

For further information on this subject, see Medicine, Pharmacology and Toxicology.

22. **Mechanism of Oxidative Catalysis by Metal Oxides**

"The Mechanism of Oxidative Catalysis by Metal Oxides," by
V. A. Royter, Institute of Physical Chemistry imeni L. V.
Pisarzhevskiy, Academy of Sciences Ukrainian SSR; Moscow,
Kinetika i Kataliz, Vol 1, No 1, May/Jun 60, pp 63-69

By using the method of tracer atoms, it was established that in
processes of oxidative catalysis by metal oxides, the oxygen of the latter
is not transferred to the reaction products. Consequently, the hypothesis
concerning the operation of a two-stage redox mechanism of catalysis is
unfounded.

Herbicides

23. **Further Research on the Gamma-Chlorocrotyl Ester of 2,4-D**

"Research in the Field of Synthesizing Herbicides. Report IV.
The Question of the Catalytic Action of Organic Bases on the
Formation of Complex Esters," by V. V. Dovlatyan and T. O.
Chakryan, Chair of General Chemistry, Armenian Agricultural
Institute; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR,
Vol 12, No 6, 1959, pp 417-423

Hexamethylenetetramine can be used in place of pyridine as the
catalyst during the synthesis of the gamma-chlorocrotyl ester of 2,4-D
(Crotylin) and also the other gamma-chlorocrotyl esters.

The formation of other complex esters by reacting the sodium salts
of carboxylic acids with halo-derivatives containing the chloromethyl
group in the vicinity of a double bond is accelerated in the presence of
traces of pyridine and hexamethylenetetramine.

The method developed on this basis for obtaining the complex esters
is completely practicable, and, therefore, can have preparative value.

Among the compounds obtained, the gamma-chlorocrotyl ester of
furan-2-carboxylic acid, the ethyl ester of furoylglycolic acid,
4-methoxybenzyl ester of 2,4-dichlorophenoxyacetic acid, and the alkyl
esters of 5-acyloxymethylfuran-2-carboxylic acids are described and their
physical properties presented, according to the authors, for the first
time.

Industrial

24. USSR Work on Anticorrosion Coatings for the Protection of Metals Under Tropical Conditions

"Development of a System of Anticorrosion Coatings for the Protection of Metals Under Tropical Conditions," by V. D. Zhebrovskiy and F. I. Rubinshteyn; Moscow, Lakokrasochnyye Materialy i Ikh Primeneniye, No 3, Jul 60, pp 25-31

In the work conducted, it could be confirmed that epoxy resins are reliable starting materials for the development of coatings that are stable at high temperatures and humidities. The new epoxy primer EP-09 T and the new epoxy enamel EP-74 T have been developed.

It was established that coatings which contain phenol-formaldehyde resins are distinguished by a high stability towards the effects of moisture. A new phenol-formaldehyde enamel designated as FL-76 has been developed.

It was also established that on the basis of polymerized resins, namely, perchlorovinyl polymers and the copolymer of vinyl chloride with vinylidene chloride, one can obtain coatings which are stable at high humidities. New enamels (PKh V-715) of different colors were developed and also a black enamel Kh S-77 of which vinyl chloride-vinylidene chloride copolymer forms the basis.

It was found that wherever the atmosphere is humid, one can use to advantage enamels based on a butyl methacrylate copolymer if these enamels are applied on epoxy primers. It was found that phenylmercury-oleate and pentachlorophenol are the most effective additives with fungicidal activity for the majority of coating materials. These fungicides can be introduced into the coating compositions if the temperature of drying does not exceed 100°. The special fungicidal wax pastes FP-1 and FP-2 have been developed for the protection of painted objects against fungi.

25. Porosity of Ion-Exchange Resins

"Porosity of Ion-Exchange Resins," by A. A. Tager, Ural State University imeni A. M. Gor'kiy; Moscow, Vysokomolekulyarnye Soyedineniya, No 7, Jul 60, pp 994-996

The microporosity of adsorbents is subjected to a theoretical discussion. It is suggested that the concept of "porosity" or "microporosity" is applicable only to solid, rigid adsorbents. It may not be applied to elastic polymers or swelled cross-linked resins since these are devoid of permament voids, i.e., pores not changing with time.

26. Characteristics Responsible for High Adsorption Capactiy of Ion-Exchange Resins

"Reasons for the High Adsorption Capacity of Ion-Exchange Resins," by A. A. Tager, A. B. Pashkov, N. V. Tsilipotkina, and N. I. Bykova, Scientific Research Institute of Plastics, Ural State University imeni A. M. Gor'kiy; Moscow, Vysokomolekulyarnye Soyedineniya, No 7, 1960, pp 997-1000

The vapor adsorption isotherms of carbon tetrachloride (inert liquid) and methyl alcohol (active liquid) have been determined for ion-exchange resins KU-2. These resins are sulfonated products of copolymerization of styrene with divinylbenzene, the amount of the latter being from 2 to 16%. The over-all pore volumes were calculated from the CCl_4 adsorption isotherm with the aid of the Dubinin-Radushkevich equation, the values found being by an order of magnitude lower than those for polystyrene and two orders lower than those for finely porous activated carbon. It thus follows that the unswelled ion exchanger possesses insignificant micro-porosity. The cause of the high adsorption capacity of the resins is not their porosity, but their considerable swelling power, as follows from the data on methyl alcohol adsorption.

27. Effect of Fillers on the Melting Points of Crystalline Polymers

"Effect of Fillers on the Melting Points of Crystalline Polymers-Part 1," by V. A. Kargin, and T. I. Sogolova, Physical Chemistry Institute imeni L. Ya. Karpov; Moscow, Vysokomolekulyarnye Soyedineniya, No 7, Jul 60, pp 1093-1098

A study has been made of the melting points and mechanical properties of crystalline polymers compounded with solid fillers. The addition of a filler not entering into chemical reaction with the polymer has been shown not to shift its melting point, i.e., it does not break down the structure of the primary crystalline regions. It does, however, change the complex of mechanical properties, i.e., it affects the secondary crystalline formations. On chemical interaction between the filler and the polymer, the melting point of the latter is lowered. The filling of a crystalline polymer with large amounts of metallic oxides causes a qualitative change in the properties of the polymer at temperatures above the melting point.

Inorganic

28. Interaction of Nitric Acid With Magnesium

"The Interaction of Nitric Acid With Magnesium," by A. A. Grinberg and A. F. V'yugina; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 6, Jun 60, pp 1389-1390

A considerable amount of work has been done on the interaction of nitric acid with metals. In the majority of investigations dealing with the subject, the rate of dissolution and the factors affecting the dissolution were studied. Much less work has been done so far as the investigation of the products that are formed as a result of the reaction between nitric acid and metals is concerned. In the work described in this instance, the products of the reduction of nitric acid which form in the course of the dissolution of magnesium in this acid and separate on boiling were investigated. It was established that as a result of the dissolution of magnesium in nitric acid, up to 160 mm of hydrogen are evolved per one gram of the magnesium dissolved. The quantity of hydrogen which evolves on dissolution of one gram of magnesium diminishes with increased concentrations of nitric acid and with the magnitude of the ratio of nitric acid to magnesium.

In the course of the investigation described, the composition of gases evolved as a result of the interaction of magnesium with nitric acid in the concentration range of 0.1-3 N and at ratios of nitric acid to magnesium in the range of 1-10 was investigated. The amounts of hydrogen, nitrogen, NO, and N_2O were determined. C. Montemartini, in experiments, the results of which were published in 1892, reported that upon dissolution of magnesium in 13% nitric acid at 15°, 86.68 mm of a hydrogen-nitrogen mixture were evolved per one gram of magnesium. In the experiments carried out in this instance, the quantities of hydrogen evolved were found to be larger than those reported by Montemartini. In the gases collected, a content of hydrogen amounting to 6-32% was found, which means that the gas mixtures were within the range of explosive hydrogen-nitrogen oxides mixtures. Mixtures containing N_2O and H_2 are safe with regard to the danger of explosion only when they contain at least 75% of nitrogen. In the experiments described, the gases collected always contained less than 75% of nitrogen.

Insecticides

29. Toxicity Data on Certain Agricultural Insecticides

"Experience Gained With the Unification of Procedures Used
in Investigating Insectofungicides," by Docent L. I. Medved'
and Candidate of Medical Sciences Ye. I. Spynu, Kiev Insti-
tute of Labor Hygiene and Occupational Diseases; Moscow,
Gigiyena i Sanitariya, No 5, 1960, pp 29-34

A rapid and accurate assessment of new insecticides should be based
on the results of comparative investigations of these chemical poisons
with those studied previously. This, however, requires a unification of
the investigation methods so that the data and the indexes obtained could
be easily compared and evaluated.

In 1955, the "Methodic Instructions for Toxicologic and Hygienic
Assessment of Insecticides Intended for Use in Agriculture" were elaborated
and issued. These instructions enable scientists to solve the problem
of the possible use of any new pesticide in about 3-4 months.

The following table on the relationship of the toxicity of organo-
phosphorus insecticides to their chemical structure is appended to the
article:

- 19 -

Formula $(RO)_2 P{\nwarrow{Y}}^{\nearrow X}$	Name	Lethality		
		Dose (mg/kg)		Concentration (mg/1)
		Mice	Rabbits	Rats, Cats
		LD_{50} (Internal)	On the skin.	Inhalation
$\diagup P{\diagdown OC_6H_4NO_2}^{\diagup S}$	thiophos	14	50-100	--
$\diagup P{\diagdown OC_6H_4SC_2H_5}^{\diagup S}$	mercaptophos (mixture of isomers)	7.6	20	0.015-0.02
$\diagup P{\diagdown SC_2H_4SC_2H_5}^{\diagup O}$	--	--	--	--
$\diagup P{\diagdown SC_2H_4SC_2H_5}^{\diagup S}$	M-74	4.8	5	0.01-0.014
$\diagup P{\diagdown SCH_2}^{\diagup S}$ CONHCONH$_2$	Acetylurea	17.5	20	--
$\diagup P{\diagdown SCH_2}^{\diagup S}$ CH=CClCH$_3$	M-93	250	--	--
$\diagup P{\diagdown OC_6H_4NO_2}^{\diagup S}$	metaphos	35	50-200	--
$\diagup P{\diagdown OC_2H_4SC_2H_5}^{\diagup S}$	methylsystox (mixture of isomers)	70	75-100	--

(Left column labels: $(C_2H_5O)_2$ for the first six rows; $(CH_3O)_2$ for the last two rows.)

- 20 -

Formula $(RO)_2 P \overset{X}{\underset{Y}{<}}$	Name	Lethality		
		Dose (mg/kg)		Concentration (mg/l)
		Mice	Rabbits	Rats, Cats
		LD_{50} (Internal)	On the skin	Inhalation
$(CH_3O)_2 P \overset{O}{\underset{SC_2H_4SC_2H_5}{<}}$	--	--	--	--
$P \overset{S}{\underset{SC_2H_4SC_2H_5}{<}}$	M-81	37	100	0.02-0.025
$P \overset{S}{\underset{\underset{CH_2COOC_2H_5}{SCHCOOC_2H_5}}{<}}$	Carbophos	450	1000-2000	--
$P \overset{S}{\underset{SCH_2CH=CClCH_3}{<}}$	M-95	350	--	--

30. <u>Hydrazides of Alkylarylthiophosphoric Acid Found to Possess Weak Contact Insecticidal Activity</u>

"From the Field of Organic Insectofungicides. LV. Synthesis of Several Hydrazides of Alkylarylthiophosphoric Acid," by A. G. Zen'kevich, P. G. Zaks, Ya. A. Mandel'boum, and N. N. Mel'nikov, Scientific Institute of Fertilizers and Insecto-fungicides (Moscow); Moscow, <u>Zhurnal Obshchey Khimii</u>, Vol 30, No 7, Jul 60, pp 2317-2319
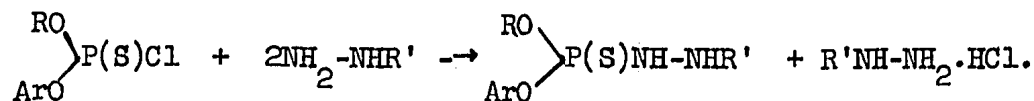
Recently a series of substituted amides and hydrazides of dialkyl-thiophosphoric acid were synthesized in the laboratory of the authors. Several of those compounds were found to be sufficiently active systemic insecticides. In connection with the study of the relationship between the structure and insecticidal activity of organophosphorus compounds and the search for new active insecticides, the authors undertook the task of synthesizing the hydrazides of alkylarylthiophosphoric acid since in many cases the replacement of an aliphatic radical by an aromatic radical in various derivatives of thiophosphoric acid results in a substantial increase in the insecticidal properties.

The synthesis of the hydrazides of alkylarylthiophosphoric acid was accomplished by reacting alkylarylchlorothiophosphates with hydrazine hydrate and phenyl hydrazine in ether.

This reaction proceeds very easily, and the corresponding hydrazides are formed with good yields. Physical data of the newly synthesized compounds accompany the article.

The compounds were tested for contact insecticidal activity by P. V. Popov and S. A. Roslavtseva against the rice weevil. The tests indicated the compounds possess very weak activity.

General equation for the reaction mentioned above:

$$\begin{matrix} RO \\ \diagdown \\ \diagup \\ ArO \end{matrix} P(S)Cl \ + \ 2NH_2\text{-}NHR' \ \rightarrow \ \begin{matrix} RO \\ \diagdown \\ \diagup \\ ArO \end{matrix} P(S)NH\text{-}NHR' \ + \ R'NH\text{-}NH_2 \cdot HCl.$$

- 22 -

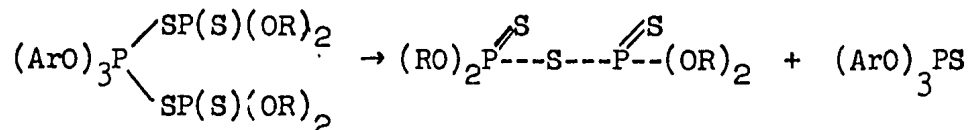31. <u>Tetraalkyltrithiopyrophosphate Obtained in Good Yields</u>

"From the Field of Organic Insectofungicides. LVI. On
the Reaction of Bis(dialkoxythiophosphon)-disulfides With
Triaryl- and Diarylphosphites," by N. N. Mel'nikov, K. D.
Shvetsova-Shilovskaya, and M. Ya. Kagan, Scientific Insti-
tute of Fertilizers and Insectofungicides (Moscow); Moscow,
<u>Zhurnal Obshchey Khimii</u>, Vol 30, No 7, Jul 60 pp 2319-2322

Recently the authors found that upon reacting the above-mentioned
disulfides with trialkylphosphites, trialkyldithiophosphates, and
tetraalkyldithiopyrophosphates are obtained in good yields. The for-
mation of the end products, apparently, occurs according to the Arbuzov
Rearrangement. The reaction between trialkylphosphites and several
other disulfides and thiocyanates proceeds analogously. However, in
some cases, the formation of thiolophosphates take place, while in
other cases, the formation of thionophosphates occurs. By analyzing
the data available, the authors concluded that the thionophosphates are
produced in those cases in which the initial trialkylphosphite contains
comparatively high-molecular ester groups which exhibit little mobility,
especially the aromatic radicals, since the latter in ester groups are
less easily replaced by other groups. To confirm this idea, the authors
undertook to study the titled reaction since owing to the low capacity for
migration by the aromatic radicals in this case, practically only triaryl-
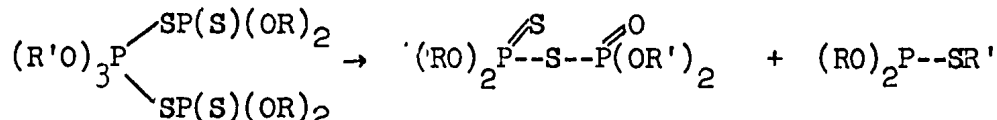thiophosphates and tetraalkyltrithiopyrophosphates should be obtained.

As a result of the experiments, the authors established that the
reaction between triarylphosphites and bis(dialkoxythiophosphos)-disulfides
proceeds almost exclusively according to the equation below, and the
triarylthiophates and tetraalkyltrithiopyrophosphates are obtained in
excellent yields:

$$[(RO)_2P(S)]_2S_2 \ + \ (ArO)_3P \rightarrow (RO)_2P\overset{S}{\underset{}{}}\text{-S-}\ P\overset{S}{\underset{}{}}(OR)_2 \ + \ (ArO)_3PS$$
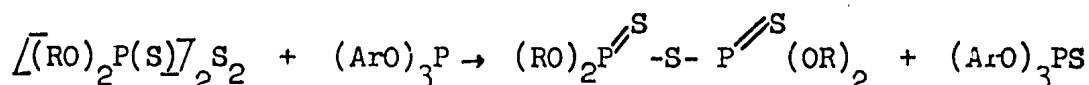
In the first instant, apparently, the formation of the unstable
addition product takes place which later decomposes according to the fol-
lowing equation:

$$(ArO)_3P\begin{cases} SP(S)(OR)_2 \\ SP(S)(OR)_2 \end{cases} \rightarrow (RO)_2P\overset{S}{\underset{}{}}\text{---S---}P\overset{S}{\underset{}{}}(OR)_2 \ + \ (ArO)_3PS$$

In the case of the trialkylphosphites, decomposition proceeds along
the lines of the following equation:

$$(R'O)_3P\begin{cases} SP(S)(OR)_2 \\ SP(S)(OR)_2 \end{cases} \rightarrow (RO)_2P\overset{S}{\underset{}{}}\text{--S--}P\overset{O}{\underset{}{}}(OR')_2 \ + \ (RO)_2P\text{--SR'}$$

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The reaction of triarylphosphites with bis(dialkoxythiophosphates)-disulfides appears to be a good method of obtaining tetraalkyltrithiopyrophosphates.

The physical properties of the newly synthesized compounds accompany the article.

32. Insect Repellants

"Investigation of Repellents. VII..1-Acyldekahydroquinolines," by Ye. Kh. Zolotarev, L. G. Yudin, T. V. Kalakutskaya, and A. N. Kost, Biological-Soil and Chemical Faculties of the Moscow State University imeni M. V. Lomonosov; Moscow, Meditsinskaya Parazitologiya i Parazitarnyye Bolezni, Vol 38, No 2, Mar/Apr 60, pp 219-223

1-Acyldekahydroquinolines, substances which are readily obtained by the acylation of dekahydroquinoline, a product of the hydrogenation of quinoline, were investigated for their insect repelling properties. The substances were found to be effective as repellants of fleas, ticks, and mosquitoes, the Aedes mosquitoes in particular. The repellant properties of the substances are greater than those of dimethyl phthalate.

Nuclear Fuels and Reactor Construction Materials

33. USSR Work on the Electrolytic Production of Thorium

"Review of Research Done in 1959 on the Electrochemistry of
Fused Salts," by A. G. Morachevskiy; Leningrad, Zhurnal
Prikladnoy Khimii, Vol 33, No 6, Jun 60, pp 1434-1448.

A detailed investigation of the production of thorium by the
electrolysis of NaCl-KCl-ThF$_4$ melts has been carried out (1) [Numbers
in parentheses refer to appended sources.] An electrolytic cell for the
production of thorium was designed (2). A brief description has been
published of the electrolytic process for the production of thorium
applied in the USSR (3). The production of metallic thorium by the
electrolysis of salt melts was also described by other investigators (4).
Thorium of high purity can be obtained by an electrolytic refining
process when a KThF$_5$ - NaCl - KCl melt (750-800°) is used as the
electrolyte (S. Kachi, T. Sato, and S. Takeuchi, Scientific Reports,
Research Institute of Tokoku University (A), 11, (1), 1959, p 56).

The processes which take place at the cathode in connection with the
electrolytic deposition of thorium from melts were investigated in detail
(5-6). It was established that simultaneous discharging of ions of
alkali metals does not take place when thorium is deposited by electroly-
sis from a mixture of molten chlorides. Introduction of fluoride ions
into the melt lowers the limiting current strength at which ions of
alkali metals are discharged simultaneously with thorium ions (7). The
equilibrium potentials of thorium in chloride melts containing initially
from 0.14 to 78% of ThCl$_4$ (680-825°) were determined. The stationary
potential of thorium in a molten equimolar NaCl-KCl mixture (700-842°) was
also determined. A reversible chlorine electrode was used as a standard
of comparison.

A study was made of the anodic dissolution and spontaneous dissolution
of thorium in melts consisting of alkali metal chlorides (8).

1. A. I. Yevstyukhin, V. S. Yemel'yanov, and G. A. Leont'yev, Trudy
   Moskovskogo Inzhenenno-Fizicheskogo Instituta (Works of the Moscow
   Engineering Physics Institute), No 1, 1959 p 7.

2. A. I. Yevstyukhin and G. A. Leont'yev, Trudy Moskovskogo Inzhenenno-
   Fizicheskogo Instituta, No 1, 1959, p 36.

3. G. Ye. Kaplan, K. V. Orlov, M. V. Sadovnikova, and M. S. Kvashnevskaya, (Paper in the subdivision of Geology, Chemistry, and Metallurgy presented at the First International Conference on Peaceful Uses of Atomic Energy).

4. N. P. Sazhin, V. M. Ioffe, F. G. Korneyev, N. I. Ardashev, D. N. Ivanova, and S. V. Goryachkin, Sbornik Nauchnykh Trudov Instituta Giredmet (Collection of Scientific Works of the State Scientific Research Institute of Rare Metals), Vol 1, 1959, p 507.

5. M. V. Smirnov and L. D. Yushina, Trudy IV Soveshchaniya po Elektrokhimii, 1956 (Transactions of the Fourth Conference on Electrochemistry, 1956), Publishing House of the Academy of Sciences USSR, Moscow, 1959, p 348.

6. M. V. Smirnov and L. D. Yushina, Izvestiya Akademii Nauk SSSR - Otdeleniye Khimicheskikh Nauk, No 11, Nov 56, p 1285.

7. M. V. Smirnov and L. D. Yushina, Izvestiya Akademii Nauk SSSR- Otdeleniye Khimicheskikh Nauk, No 2, Feb 59, p 251.

8. M. V. Smirnov, N. Ya. Chukreyev, and L. D. Yushina, Trudy Instituta Khimii, Ural'skiy Filial Akademii Nauk SSSR (Works of the Institute of Chemistry, Ural Affiliate of the Academy of Sciences USSR), [No] 2, 1958, p 171.

34. Uranium-Bearing Wulfenite

"Uranium-Bearing Wulfenite," by A. A. Chernikov, T. L. Pokrovskaya, Yu. S. Nesterova, and N. I. Organova, Institute of Geology of Mineral Deposits, Petrography, Mineralogy, and Geochemistry, Academy of Sciences USSR; Leningrad, Zapiski Vsesoyuznogo Mineralogicheskogo Obshchestva, Part 89, No 2, Mar/Apr 60, pp 180-186

A method for the analysis of uranium-bearing wulfenite which has been developed in 1957 by the authors is described. Wulfenite that contains uranium was orginally discovered in 1954.

35. <u>USSR Work on the Electrolytic Production of Zirconium</u>

"Review of Research Done in 1959 on the Electrochemistry of Fused Salts," by A. G. Morachevskiy; Leningrad, <u>Zhurnal Prikladnoy Khimii,</u> Vol 33, No 6, Jun 60, pp 1434-1448

It was established that by using an electrolytic procedure, metallic zirconium can be produced which is no less pure and ductile than zirconium produced by the iodide method. The best electrolyte is a K_2ZrF_6 + KCl mixture containing 25-30% of K_2ZrF_6. The optimum temperature for carrying out the electrolysis is 750-800°. The electrolysis should be conducted in an atmosphere of pure argon. A current density of 350-450 amperes per square decimeter should be used (1) [Numbers in parentheses refer to appended sources.].

Work has been done on the production of zirconium by the electrolysis of K_2ZrF_6 dissolved in either KCl of NaCl (2).

The decomposition (separation) potential, the reverse EMF due to polarization, and the cathodic potential have been determined for molten K_2ZrF_6 at five compositions of the K_2ZrF_6 - NaCl - KCl melt (700-800°) (3). The decomposition potentials of zirconium chloride and hafnium chloride were calculated for different temperatures within the range of 900-1400°K (4).

The fusibility diagrams of the systems $ZrCl_4$ - NaCl and $ZrCl_4$ - KCl, which are of importance from the practical standpoint, were determined (5-6). By measuring vapor pressures, the thermal stability of compounds formed by $ZrCl_4$ with chlorides of alkali metals was investigated (7).

1. A. N. Ogarev, V. V. Shentyakov, N. G. Aksenov, R. B. Shtrapenina, and L. A. Stepina (Paper presented at the Second International Conference on Peaceful Uses of Atomic Energy)

2. T. P. Klochikhina and A. S. Klimchak, <u>Sbornik Nauchnykh Trudov Instituta Giredmet</u> (Collection of Scientific Works of the State Scientific Research Institute of Rare Metals), Vol 1, 1959, p 534.

3. I. N. Sheyko and V. G. Feshchenko, <u>Ukrainskiy Khimicheskiy Zhurnal</u>, Vol 25, 1959, p 166.

4. L. P. Ruzinov and S. F. Belov, <u>Tsvetnyye Metally</u>, Vol 32, 1959, pp 12 and 71.

5. I. S. Morozov and B. G. Korshunov, <u>Zhurnal Neorganicheskoy Khimii</u>, Vol 1, 1956, p 145.

6. I. S. Morozov and Sung Yin-chu, Zhurnal Neorganicheskoy Khimii, Vol 4, 1959, p 678.

7. I. S. Morozov and Sung Yin-chu, Zhurnal Neorganicheskoy Khimii, Vol 4, 1959, p 2551.

36. Structure of Zirconium Alloys

"Investigation by the Radioactive Tracer Method of the Mobility, Interaction Between Atoms, and Distribution of Elements of Zirconium and Its Alloys," by G. B. Fedorov, Yu. F. Babikova, P. L. Gruzin, F. I. Zhomov, and G. G. Ryabova, Chair of Metallurgy and Metal Science, Moscow Engineering Physics Institute; Ivanovo, Izvestiya Vysshikh Uchebnykh Zavedeniy SSSR - Khimiya i Khimicheskaya Tekhnologiya, Vol 3, No 3, Jun 60, pp 395-401

By using radioactive isotopes as tracers, the sublimation, diffusion, electrodiffusion, and distribution of impurities and admixtures in zirconium and its alloys were investigated. It was established that:

1. Zirconium has an abnormally low heat of sublimation and an abnormally low energy of the activation of diffusion, which is in agreement with the low values of the modulus of normal elasticity and is apparently due to the large interatomic distances in the crystal lattice of this metal;

2. The difficultly soluble admixtures of carbon, calcium, chromium, and iron are distributed in a very irregular manner in zirconium; the manner of their distribution is not changed by heat treatment; the lack of uniformity in the distribution of the relatively highly soluble tin disappears on high temperature annealing;

3. In zirconium alloys, tin and iron are present as anions, and carbon is present as a cation.

37. **Fusibility Diagram of the System Praseodymium Chloride-Magnesium Chloride-Potassium Chloride**

"Fusibility Diagram of the System Praseodymium Chloride-Magnesium Chloride-Potassium Chloride," by Z. N. Shevtsova, I. S. Morozov, and O. A. Yefremova, Chair of Chemistry and Technology of Rare and Dispersed Elements, Moscow Institute of Fine Chemical Technology; Orzhonikidze, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Tsvetnaya Metallurgiya, Vol 3, No 3, May 60, pp 109-111.

The interaction of praseodymium chloride with the chlorides of magnesium and potassium during the joint crystallization of these salts from their melts was investigated. The surface of the liquids of the system $PrCl_3$ - $MgCl_2$ - KCl was determined.. The boundaries of the crystallization fields in the system in question are also determined.

38. **System $CeCl_3$ - $CaCl_2$ - Na, Cl**

"Investigation of the Interactions of Rare-Earth Metal Chlorides With the Chlorides of Alkaline Earths and Alkali Metals in Melts; Thermal Analysis of the System $CeCl_3$ - $CaCl_2$ - NaCl," by B. G. Korshunov, I. S. Morozov, and V. I. Ionov, Chair of the Technology of Rare and Dispersed Elements, Moscow Institute of Fine Chemical Technology imeni M. V. Lomonosov; Ivanovo, Izvestiya Vysshikh Uchebnykh Zavedeniy SSSR - Khimiya i Khimicheskaya Tekhnologiya, Vol 3, No 3, Jun 60, pp 402-404

By employing the methods of thermal analysis, the fusibilities in the systems $CeCl_3$ - $CaCl_2$, $CeCl_3$ - NaCl and $CeCl_3$ - $CaCl_2$ - NaCl were investigated.

On the basis of the data obtained, a constitutional diagram was constructed. The nonvolatile chloride melt obtained as a result of the treatment of loparite raw material by the chlorine method consists essentially of the chlorides of cerium, calcium, and sodium.

Organic

39. Optical Anisotropy and the Shape of Siloxane Polymer Molecules in Solution

"The Optical Anisotropy and the Shape of Siloxane Polymer Molecules in Solution, by V. N. Tsvetkov, E. V. Frisman, and N. N. Boytsova, Physics Institute, Leningrad State University; Mosow, Vysokomolekulyarnye Soyedineniya, No 7, Jul 60, pp 1001-1009.

The flow birefringence of polydimethylsiloxane (PDMS) and polydimethylphenylsiloxane (PDMPS) solutions has been investigated. The molecular coil asymmetry has been determined. This has been found to be somewhat lower than the values usually obtained for Gaussian chains in solutions.

The segment anisotropy has been determined, and the anisotropy of the monomeric unit of PDMS and PDMPS, as well as the anisotropy difference of the SiC and SiO groups, has been calculated.

An analysis of the data obtained led to the conclusion that there is no marked hindrance to the rotation of the phenyl groups of PDMPS about their bond with the siloxane chain.

40. Investigation of the Polyalumoethylsiloxane Catalyzed Polymerization of Polyorganosiloxanes

"Investigation of the Polyalumoethylsiloxane Catalyzed Polymerization of Polyorganosiloxanes," by K. A. Andrianov and A. A. Zhdanov, Institute of Organoelemental Compounds, Academy of Sciences USSR; Moscow, Vysokmolekulyarnye Soyedineniya, No 7, Jul 60, pp 1071-1076

It has been established that in the polymerization of polyorganosiloxanes under the influence of polyalumoethylsiloxanes, coordination bonds are formed between aluminum atoms of the polyalumoethylsiloxane chair and oxygen atoms of the polyorganosiloxane.

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41. <u>Synthesis of Cyclic Organosilicon Compounds With Phenylenesiloxane Chains in the Molecule</u>

"Synthesis of Cyclic Organosilicon Compounds With Phenylene-siloxane Chains in the Molecule," by K. A. Andrianov and V. E. Nikitenkov, All-Union Electrical Engineering Institute imeni V. I. Lenin; Moscow, <u>Vysokomolekulyarnye Soyedineniya,</u> No 7, Jul 60, pp 1099-1102

The hydrolysis in acid media has been investigated in the cases of 1,5-bis-(methyldichlorosilane) benzene and 1-methyldichlorosilane-4-phenyldichlorosilanebenzene. The reaction has been shown to lead to polymers with phenylenesiloxane chains in the molecule, prone to structuration at moderate temperatures.

The mechanism of hydrolysis and of condensation has been studied, and it has been shown that the formation of polymers with phenylene-siloxane chains proceeds via the formation of cyclic compounds possessing high reactivities.

The mechanism of formation of the polymers has been established on the basis of the new cyclic crystalline compounds isolated.

42. <u>Addition Reactions Using Ultraviolet Light</u>

"New Method for Synthesizing Esters of Phosphinic and Thio-phosphinic Acids. XXXIV. Addition of Dialkylthio-phosphorous Acids and Acid Esters of Ethyl- and Phenylphosphinous Acids to Unsaturated Hydrocarbons", by A. N. Pudovik and I. V. Konovalova, Kazan' State University; Moscow, <u>Zhurnal Obshchey Khimii,</u> Vol 30, No 7, 1960, pp 2343-2352

Dialkylthiophosphorous acid and the acid esters of ethyl- and phenyl-phosphinous acids are added to olefins in the presence of benzoyl peroxide or upon exposing them to ultraviolet light.

The addition products, esters of alkylthiophosphinic, dialkyl-phosphinic, and alkylphenylphosphinic acids, are obtained in yields ranging from 40 to 65%.

The addition of dialkylthiophosphorous acids and acid esters of ethyl- and phenylphosphinous acids to olefins proceeds according to the radical mechanism, contrary to the rule of Markovnikov.

Three tables offering the physical characteristics of 35 newly synthesized compounds accompany the article.

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Physical

43. Relation Between the Degree of Completeness of Adsorption at a
Catalyst Surface on the Heats and Energies of Activation of
Adsorption

"Nature of the Changes in the Heats and Energies of Activation
of Adsorption Taking Place With Changing Degrees of Completeness
of Adsorption," by N. P. Keyer, Institute of Physical Chemistry,
Academy of Sciences USSR; Moscow, Kinetika i Kataliz, Vol 1,
No 1, May/Jun 60, pp 83-93

Investigation by isotope tracer methods of the adsorption of gases
on semiconductor and metal catalysts demonstrated that the principal
effect on changes in the heats and energies of activation of adsorption
with increased degrees of coverage of the surface of the catalyst is
exerted by the inhomogeneity of the active surface of the catalyst.
The inhomogeneity of the active surface of semiconductor catalysts is
assumed to be due to the formation of negatively or positively charged
defects which develop because of the presence of impurities. These
defects change the electron potential of the surface.

44. Mechanism of Hydrogen Isotope Exchange on Platinum Foils

"The Mechanism of Hydrogen Isotope Exchange on Platinum
Foils," by G. K. Boreskov and A. A. Vasilevich, Physical
Chemistry Institute imeni L. Ya. Karpov; Moscow, Kinetika
i Kataliz, Vol 1, No.1, May/Jun 60, pp 69-82

The isotope exchange in molecular hydrogen and also the exchange of
adsorbed hydrogen with gaseous hydrogen on platinum foils have been
investigated at 78 and 90° K using deuterium and tritium. It was es-
tablished that there is an inhomogeneity of the platinum surface with
respect to the adsorption of hydrogen. The separation factors of
hydrogen isotopes undergoing adsorption were determined. With the use
of data obtained by measuring kinetic isotope effects, the molecular
order of the exchange reaction was calculated. The possible mechanisms
of the process involved are discussed.

45. Study of the Flow Birefringence of Isotactic Polystyrene Films

"A Study of the Flow Birefringence of Isotactic Polystyrene
Films," by O. V. Kallistov and Ye. V. Korneyeva, Institute of
High-Molecular Compounds, Academy of Sciences USSR; Moscow,
Vysokomolekulyarnye Soyedineniya, No 7, 1960, pp 1056-1062

The flow birefringence of isotactic polystyrene films has been
investigated. The flow birefringence and photoelastic coefficient have
been found to depend upon the time of heating the films above the
softening temperature. It was noted that such a relationship is
associated with the initial phase of crystallization of the film.

A correlation has been obtained between the photoelastic coefficient
and temperature for the isotactic polymer. The method employed in the
study of the photoelastic properties of isotactic polystyrene films is
described.

46. Fractionation of Drops in the Turbulent Core of a Stream

"On the Effect of Time on the Fractionation of Drops in a
Stream With a Turbulent Bubbling Gas," by V. N. Sokolov and
A. S. Reshanov, Leningrad Technological Institute imeni
Lensovet; Moscow, Zhurnal Prikladnoy Khimii, Vol 33, No 5,
1960, pp 1068-1075

The authors found that the largest size of $\delta_{critical}$ drops stable
in a stationary turbulent stream does not depend on the time of
fractionation. The dimension $\delta_{critical}$ can be determined by the
maximum on the fractional state curve, but it does not correspond to
the average diameter of the drops in a polydispersed system. The number
of drops have a diameter $\delta_{critical}$ increases with time.

Equations were obtained which determine the distribution of drops in
a system according to their size which are compatible with experimental
data for drop dimensions greater than $\delta_{critical}$, i.e., they
characterize the fractionation of drops in the turbulent core of a stream.

Radiation Chemistry

47. Paramagnetic Resonance of Fluoroalkyl and Nitrosofluoroalkyl Radicals
     in Irradiated Teflon

     "On the Electron Paramagnetic Resonance Spectra of Fluoroalkyl
     and Nitrosofluoroalkyl Radicals in Irradiated Teflon," by ʻ-. ·ʼ
     Ya. S. Lebedev, Yu. D. Tsvetkov, and V. V. Voyevodskiy; ;·ʼ
     Moscow, Optika i Spektroskopiya, Vol 8, No 6, Jun 60, pp 811-814

     The spectra of electron paramagnetic resonance due to the presence of
fluoroalkyl and nitrosofluoroalkyl radicals in irradiated teflon at
elevated temperatures were determined. An analysis of the superfine
structure was carried out, and the temperature dependence of the width
of the lines was determined. The results obtained in the experimental
work were compared with theoretical and experimental data from the liter-
ature. ͈

48. Effect of Gamma Radiation of the Dielectric Properties of Some
     Electrical Insulation Materials

     "The Effect of Gamma Radiation on the Dielectric Properties
     of Some Electrical Insulation Materials; Part I - Glass
     Textolite SKM-1," by K. A. Vodop'yanov and B. I. Vorozhtsov,
     Siberian Physico-Technical Institute at Tomsk State
     University imeni V. V. Kuybyshev; Tomsk, Izvestiya Vysshikh
     Uchebynkh Zavedeny-Fizika, No 4, Apr 60, pp 227-232

     This article reports experimental data obtained in an investigation
of the action of gamma-radiation on the dielectric properties of glass
textolite SKM-1. It was established that as a result of irradiation
under definite conditions (those involving low temperatures or humidity
encountered under tropical conditions), some dielectric characteristics
of glass textolite are changed; depending on the magnitude of the dose,
there are differences in the effect produced by irradiation.

49. Radiation Polymerization of Phenylacetylene

     "Radiation Polymerization of Phenylacetylene," by I. M.
     Barkalov, A. A. Berlin, V. I. Gol'danskiy, and B. G..
     Dzantiyev, Institute of Chemical Physics, Academy of
     Sciences USSR; Moscow, Vysokomolekulyarnye Soyedineniya,
     No 7, Jul 60, pp 1103-1108

     On irradiation of phenylacetylene with fast electrons, a yellow
colored polymer is formed, giving a narrow EPR signal. The radiochemical
yield G is 8-9 moles/100 eV.

A kinetic study of the polymerization reaction, both in bulk and in solution, was undertaken. The specific properties of polyphenylacetylene are the cause of the proportionality between the rate of polymerization and the rate of initiation (V $\sim$ 1), unusual for radiation polymerization in the liquid phase.

By a study of the EPR spectrum, it was found that in polyphenylacetylene there is considerable delocalization of the unshared electrons. Owing to the fact that the reactivity of such molecules diminishes with their length, there is no definite borderline between the chain propagation and termination processes. The proposed "fading" mechanism makes it possible to explain the V-I relation and the low over-all activation energy.

Among the specific characteristics of this type of reaction are an accelerating action of oxygen and a high energy transfer from the solvent to phenylacetylene observed during polymerization in solution.

Technology

50. Organization for Research and Development Stressed

"From Laboratory to Production," by M. Dalin, Academician of the Academy of Sciences, Azerbaydzhan SSR; Baku, Bakinskiy Rabochiy, 27 Mar 60, p 3

Since one of the most important problems in the expansion of the chemical industry of the USSR, which is "sharply accelerating the tempo of technical progress," is the creation of new, more ideal processes in critically short periods, the author has made the following observations on the developmental processes with reference to the chemical enterprises:

The development of new processes usually occurs in a series of successive stages. Initially, detailed laboratory investigations are conducted. After this, as these investigations yield positive results, the following stage begins -- operations are performed on a larger scale, not at laboratory facilities, but at experimental plants. In the process, the planning of the experimental plants frequently is entrusted to another organization, and the construction and acceptance, to still a third organization. As a result, the transition from laboratory to industry often is delayed because of the absence of data for planning.

In this respect, several considerations might be mentioned on how to improve the organization of research during the development of new processes.

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Above all, it is necessary to stress that in the search for new ways to produce synthetic materials, the research efforts must be carried out on a broad front. With this in mind, it is necessary to pay special attention to the selection of the basic directions so that the programs conducted have both scientific and practical significance.

Usually, the exploratory research in each direction is performed by a small group of chemists and engineers. This is the rule. However, it is necessary to strive so that immediately after obtaining positive results in the laboratory, powerful groups of researchers headed by highly qualified technologists are organized on the laboratory base for the rapid and thorough development of the new processes at pilot and experimental installations.

The meaning of the development of effective equipment and rational technological arrangements and the creation of control-measuring instruments and automatic devices has for the subsequent industrial acceptance is well known. It is obvious that for the solution of these serious and responsible tasks, the scientific research organization, as well as the chemical sectors, must have modern physicochemical laboratories, powerful planning staffs, and well-equipped experimental facilities. The groups which are engaged in the development of new processes must have on their staffs, in addition to qualified chemists and technologists, designers and specialists on control-measuring instruments and automatic devices.

Only such a broad and simultaneously flexible organization of efforts in being will guarantee the rapid and efficient development of new processes.

III. ELECTRONICS

Communications

51. New Methods of Modulation

"Transmission of Discrete Signals With the Aid of Phase-
Difference Modulation," by N. P. Bobrov; Moscow, Elektrosvyaz',
No 6, Jun 60, pp 3-9

The modulation methods used in transmission of discrete signals are
divided into static (AM, FM, PM, FCM) and dynamic. The dynamic group
comprises a number of relatively new modulation methods which have found
practical application only in recent years; therefore, their terminology
has not yet been well established. The author suggests naming them as
follows: amplitude-difference modulation (ADM), phase-difference
modulation (PDM), and frequency-difference modulation (FDM).

The common feature of all these methods of modulation is that the
information is transmitted, not by its actual value, but by the changes
(difference) in carrier parameters between two or more sendings i.e.,
to each value of a transmitted discrete signal, there corresponds a
definite difference of parameters between any two or more sendings of
the modulated signal.

Of the mentioned methods, phase-difference modulation is of greatest
interest since, on the basis of this method, several practical systems of
communication have been designed. The phase-difference system generally
consists of three main units: code converter, phase modulator, and
carrier-frequency oscillator. The efficiency of the phase-difference
modulation system depends on the number of binary digits the system is
able to transmit in a unit time at a specified width of the channel.

The minimum band-width of the channel and the speed of transmission
for various systems of phase-difference modulation are given in the article.

52. Crosstalk Distortions in Multichannel Communication Systems

"Crosstalk Distortions in FM Multichannel Communication
Systems Originating in Scatter Propagation of UHF," by A. V.
Prosin; Moscow, Radiotekhnika, No 8, Aug 60, pp 3-12

In scatter propagation of UHF, the composite signal at the place of
reception is formed by a multiplicity of waves arriving through various
paths and, therefore, has different amplitudes and phase shifts. This
results in a nonlinear distortion of the information and crosstalk noises
in telephone channels.

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A method was worked out for calculating the crosstalk distortions of multichannel FM transmission and the dependence of such distortions on the length of the route and the width of the radiation pattern.

This experiment has revealed that a decrease in the crosstalk noises can be secured by increasing the antenna directivity in the vertical plane and by reducing directivity in the horizontal plane. It was also observed that the crosstalk interference increases rapidly with increase in length of the route and the number of channels involved. The magnitude of such distortions would be low if the fall-off of the correlation function for turbulent inhomogeneities is smooth and the spectrum of such inhomogeneities is narrow.

Utilization of diversity reception, with subsequent addition of the compound signal, reduces crosstalk noises by almost one half. It is difficult to secure satisfactory reception with 120-channel transmission for distances greater than 300 km, even with diversity reception.

53. Present Status of Television Broadcasting in USSR

"To Promote Further Development and Improvement of Television Technique," by S. Kaftanov, State Committee for Radio and Television Broadcasting; Moscow, Tekhnika Kino i Televideniya, No 5, May 60, pp 1-3

The article contains the following passages:

"At the present time, Soviet television broadcasting is still limited in most cases to one channel.

"Television studio technique does not satisfy present-day require-ments. Thus, for instance, the transmitting tubes for the studio cameras have rather poor sensitivity and require a great quantity of powerful light sources which consume a great deal of electric power and heat up the studios excessively.

"The television centers do not have provisions for two-language broadcasting. In addition, many television studios are not technically equipped for broadcasting of elaborate educational programs.

"Soviet technical equipment for outdoor television recording is also unsatisfactory. Televising of outdoor events is often difficult due to bulkiness and poor mobility of the portable television stations. It should be noted that it required 8-10 hours to set up a mobile television station just to shoot a 15- to 20 minute outdoor event.

"The shortcomings of our technical television equipment are further augmented by the shortage of highly qualified specialists. Thus, for example, for all the television studios of the nation, there are only seven senior motion-picture equipment engineers, eight motion-picture equipment engineers, one chemist-engineer, and three sound-recording engineers."

54. Recent Soviet Patents in the Field of Communications

"Authorship Certificates" (unsigned article); Moscow, Elektrosvyaz', No 6, Jun 60, p 74

Class $21a^1$, 5_{02}. No 123195. R. S. Brazhenas. Device for Automatic Commutation With Perforator Reception of Telegrams.

Class $21a^1$, 11_{01}. No 123196. L. A. Korobkov. A Method of Recording Symbols With Electronic Telegraph Instrument.

Class $21a^1$, 32_{04}. No 123197. I. I. Tsukerman. A Method for Narrowing the Spectrum of the Television Signal.

Class $21a^1$, 32_{11}. No 123198. S. V. Sharov. Device for Revealing Concealed Images on Magnetic Carrier.

Class $21a^1$, 32_{35}. No 124463. I. K. Malakhov-Kamartan. Device for Transmitting Single-Line Telvision Image.

Class $21a^1$, 32_{35}. No 124464. S. I. Kochergin. Vacuumless Television Transmitting Device for Simple Scanning.

Class $21a^1$, 32_{35}. No 124465. V. A. Budnikova, Ya. A. Oksman, and B. Ye. Smolyanskiy. Television Transmitting Tube.

Class $21a^1$, 32_{35}. No 134466. I. K. Malakhov-Kamartan. Color Television Transmitting Tube.

Class $21a^1$, 34_{31}. No 123200. V. V. Odnol'ko, and A. N. Basov. A Method of Separating Color Signals From a Single Black-and-White Television Tube for the Purpose of Color Television Transmission.

Class $21a^1$, 35_{10}, No 124468. V. P. Mandrazhi. A Method of Protecting the Synchronization System of a Television Receiver from Pulse Interferences.

Class $21a^1$, 36. No 123202. A. B. Arnov, and O. V. Sidorenko. Device for Automatic Measurement of Amplitude and Video-Pulse Duration.

Class $21a^2$ 18_{08}. No 123204. O. A. Kossov. Power Amplifier Built With Switching Transistors.

Class $21a^4$, 14_{01}. No 123207. A. D. Artym. Method and Device for Increasing the Leading Edge Steepness and Power of a Radio Pulse.

Class $21a^4$, 27. No 123208. N. I. Cnecherin and Yu. M. Kozlov. Contactless Three-Position Relay.

Class $21a^4$, 48_{08}. No 123210. Ye. D. Valunskiy and B. G. Avetikov. Mechanism for Swinging Antenna With a Phase Shift.

Class $21a^4$, 65. No 124481. S. Ye. Zagik and L. M. Kapchinskiy. Antenna for Reception of Television Broadcasting.

Components

55. <u>Values of Work Functions of Film Cathodes Criticized</u>

"Relationship of Work Function of Film Cathodes to the Degree of Coating," by V. N. Shrednik; Moscow, <u>Radiotekhnika i Elektronika</u>, Vol V, No 8, Aug 60, pp 1203-1210

"It is shown that the generally accepted values of so-called 'optimum' coatings of cathodes with adsorbate atoms, corresponding to the minimum work function, are equal to $\Theta_0 = 1$ and not $\Theta_0 = 0.7$. The author introduces the determination of the degree of coating as the ratio of surface concentration of adsorbate atoms to the surface density of the same adsorbate in a single layer on a given crystallographic face $\{hkl\}$ of the base layer."

CPYRGHT

[This report was presented at the Ninth All-Union Conference on Cathode Electronics held in Moscow on 21-28 October 1959.]

56. <u>Method Proposed for Making Pure Emitters of Fusible Metals</u>

"New Method for Making Autoelectronic Emitters of Fusible Metals and Alloys," by A. P. Komar, V. P. Savchenko, and V. N. Shrednik; Moscow, <u>Radiotekhnika i Elektronika</u>, Vol V., No 8, Aug 60, pp 1342-1346

A method using a local vacuum discharge, retarded by a strong feedback, is used to obtain pure autoelectronic emitters of fusible metals and alloys. The emitters are stable and have a pure metallic surface.

Emission patterns of pure single crystals of Au, Ag, and Cu and the first emission patterns obtained of single crystals of single-phase alloys Ni_3Mn, Cu_3Pt and Cu_3Au are given. The proposed method expands the possibilities of research using an autoelectronic projector.

[This report was presented at the Ninth All-Union Conference on Cathode Electronics held in Moscow on 21-28 October 1959.]

57. Analysis Made of Processes in Millimicrosecond Blocking Oscillator

"Millimicrosecond Blocking Oscillator," by Yu. P. Mel'nikov and S. Ya. Shats; Moscow, Radiotekhnika, Vol 15, No 6, Jun 60, pp 36-44

In a millimicrosecond blocking oscillator, the duration of all parts of a pulse (front, peak, etc.) depend simultaneously on all of the parameters of the circuit. A change in one parameter may have a different effect on the duration of different parts of the pulse. There exists a region of optimum relationships between the parameters of the circuit for obtaining a pulse of minimum duration with sufficient amplitude. Proceeding from these assumptions, the authors analyze the processes in a milli-microsecond blocking oscillator and devise a method for the technical calculation of the oscillator.

An experimental check of calculations was made for a number of types of tubes, transformers, core materials, and windings, and discrepancies, in the majority of cases, did not exceed 20%.

58. Wide-Band Piezoelectric Accelerometers

"Calculation and Design of Piezoelectric Accelerometers," by P. V. Novitskiy; Moscow, Priborostroyeniye, No 6, Jun 60, pp 6-9

The recent rapid technological development in several fields of engineering has brought up the problem of measuring the fast reversals of dynamic load imposed on the parts and subassemblies of various machines. This problem can be viewed as a measurement of various parameters of vibrations in a wide range of oscillation frequencies. The range of these parameters is increasing incessantly and rapidly. At present, such parameter limits are as follows: from 0.1 to 1,000 m/sec^2 with respect to acceleration and from 0.1 to 2,000 cps with respect to frequency. In the near future, in conjunction with the effort to master outer space, it is reasonable to expect that these parameters will widen their ranges as follows: from 10^{-5} to 10^4 m/sec^2 with respect to acceleration and from 10^{-4} to 10^4 cps with respect to frequency.

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To measure the vibration parameters in the frequency range of 10 to 10^4 cps, piezoelectric acceleration transducers incorporating quartz or barium titanate peizoelements are the most promising at this stage of development.

The Laboratory of Physicotechnical Measurements at the Leningrad Polytechnic Institute has advanced a unique constructional design for these transducers, not affected by transverse vibrations. The construction of transducers with a resonance frequency of 15 kc and sufficiently high sensitivity does not present any difficulty if high-grade materials, such as titanium and tungsten, are available. Application of a corrector circuit to such transducers ensures the measurement of vibrational acceleration in a frequency range from 10 to 10^4 cps.

Instruments and Equipment

59. Prospects for Use of Isotopes in Electronic Instruments Discussed

" β- Electron Emission in a Vacuum and Its Application," by P. V. Timofeyev and Yu. A. Simchenko; Moscow, Radiotekhnika i Elektronika, Vol V, No 8, Aug 60, pp 1197-1202

A brief resume is given of progress in the development of voltage sources based on the conversion of β- electron emission into electrical current. The application of radioactive isotopes Pm^{147} and $Sr^{90}-Y^{90}$ as sources of β-radiation is mentioned, and the properties of these isotopes are described.

A typical nuclear source of high voltage, using $Sr^{90}-Y^{90}$ as the radioactive source and having an efficiency of approximately 75%, is described. Prospects for the use of isotopes as electron sources in electronic instruments are discussed.

[This report was presented at the Ninth All-Union Conference on Cathode Electronics held in Moscow on 21-28 October 1959.]

60. Stroboscopic Study of Oscillations of Piezoelectric Plates

"High-Frequency Stroboscope With Neon Lamp for Studying the Oscillations of Piezoelectric Plates," by B. A. Finagin, Leningrad Shipbuilding Institute; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Priborostroyeniye, Vol 3, No 3, 1960, pp 38-42

A description is given of a method and apparatus for studying the oscillations of piezoelectric plates. The method utilizes a stroboscopic arrangement and affords the possibility of viewing and photographing the resonance patterns for oscillations up to 10^5-10^6 cycles per second. A number of photographs of resonance patterns are given.

This article was reported before the 14th Scientific-Technical Conference of the Scientific-Technical Society of Radio Engineering and Electrical Communications in Leningrad in April 1959.

Materials

61. Magnetostrictive Ferrites

"Magnetostrictive Ferrites as Material for Electroacoustic Transducers," by I. P. Golyamina, Acoustics Institute, Academy of Sciences USSR; Moscow, Akusticheskiy Zhurnal, No 3, 1960, pp 311-320

Work has been conducted since 1954 at the Acoustics Institute, Academy of Sciences USSR, under the direction of N. N. Andreyev on the problem of utilizing ferrites as electroacoustic transducers. The work of N. N. Andreyev's laboratory included measurement of the parameters of ferrites, search for new chemical compositions, and improvement in the technology of manufacture of magnetostrictive ferrites.

The article gives the mechanical, magnetic, and magnetostrictive properties of the following four ferrites suitable for electroacoustic transformation: ferrite 21 ($NiO.Fe_2O_3$), ferrite 38 ($NiO_{0.5} \cdot ZnO_{0.5} \cdot Fe_2O_3$), ferrite 41 ($NiO_{0.99} \cdot CoO_{0.01} \cdot Fe_2O_3$), and ferrite 42 ($NiO_{0.98} \cdot CoO_{0.02} \cdot Fe_2O_3$).

It was shown that the magnetostrictive properties of these ferrites are comparable to the properties of conventional metallic magnetostrictive elements. The resonant frequencies of the manufactured ferrite cores were 26, 55, and 74 kc.

The author thanks N. N. Andreyev, L. I. Ganeva, and V. K. Chulkova for their assistance.

62. Thermionic Properties of BaO : WO_3 Compounds Examined

"Thermionic Properties of the Tungstates of Alkali Earth Metals," by B. V. Bondarenko, Ye. P. Ostanchenko, and B. M. Tsarev; Moscow, Radiotekhnika i Elektronika, Vol V, No 8, Aug 60, pp 1246-1253

This work attempts to show the optimum composition of barium tungstate which would be stable in a vacuum at temperatures of 1400-1700°K and have the best possible emission properties. The effect of replacing barium with strontium and calcium in tungstates on the thermionic properties of the latter is also explained.

Results show that:

1. The tungstates of alkali metals may be synthesized by sintering in air, as well as in hydrogen, as is usually done.

2. Of the barium tungstates synthesized, three are stable in a vacuum at high temperatures -- Ba_3WO_6, $BaWO_4$, and a new phase Ba_2WO_5.

3. It was established that the best thermionic emission properties were found in the compound Ba_3WO_6 and that replacing more than one of the three moles of barium oxide with strontium or calcium oxide decreases the emission properties of this tungstate. The properties of Ba_3WO_6 are practically not affected when the compound is synthesized in hydrogen or air.

[This work was presented at the Ninth All-Union Conference on Cathode Electronics held in Moscow on 21-28 October 1959.]

63. <u>Emission Images of W_2C and Thoriated W_2C Cathodes Studied</u>

"Autoelectronic Emission of Tungsten Carbide and Thoriated Tungsten Carbide," by Yu. V. Zubenko and I. L. Sokol'skaya; Moscow, <u>Radiotekhnika i Elektronika</u>, Vol V, No 8, Aug 60, pp 1327-1337

A comparison is made between the emission images of a single-crystal emitter in a field emission microscope (electron projector), obtained during adsorption, migration, and vaporization of thorium on tungsten and tungsten carbide, and fundamental emission characteristics such as the relationship between emission current and coating, work function, migration and vaporization energies, etc. It was found that the vaporization rate of thorium with tungsten is considerably greater than the vaporization rate of thorium with tungsten carbide, but their vaporization energies are equal. A numerical value for vaporization energy equal to 4 ev was obtained.

[This report was presented at the Ninth All-Union Conference on Cathode Electronics held in Moscow on 21-28 October 1959.]

64. <u>Glass Fiber From Rock</u>

"Glass Fiber From Rock" (unsigned dispatch from Yerevan); Moscow, <u>Ekonomicheskaya Gazeta</u>, No 81, 2 Sep 60, p 2

Workers of the Laboratory at the Scientific Research Institute of Chemistry at the Armenian SSR Sovnarkhoz succeeded in producing glass fiber derived from stone. This glass fiber exhibits superior electrical insulation characteristics, a high heat stability, a high tensile strength, and a low hygroscopicity.

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The technical processes for the production of glass fibers from rock are less complicated than those for the production of glass fiber from glass: if the new method is applied, there is no need to use certain expensive oxides and salts.

Glass fiber will be applied extensively in many industrial fields.

At present, workers at the institute mentioned are investigating the technical and economic aspects of producing glass fiber from different species of rock. On the basis of the investigations being carried out, they are preparing instructions to be used in connection with the introduction of the new method into industrial application. They are receiving assistance from the All-Union Scientific Research Institute of Glass Fibers.

65. Quantum Yield of the Fluorescence of Some Substances in Polystyrene

"The Quantum Yield of the Fluorescence of Some Substances in Polystyrene," by Ye. A. Andreyeshchev and I. M. Rozman; Moscow, Optika i Spektroskopiya, Vol 8, No 6, Jun 60, pp 828-831

The results of measurements of the quantum yield of the fluorescence of eight organic substances in polystyrene are described. The methods used to carry out the measurements are also described. The substances in question are 2,5-diphenyl-1,3-oxazole, 2,5-diphenyl-1,3,4-oxdiazole, acenaphthene, p-terphenyl, 1,1,4,4-tetraphenyl-1,3-butadiene, 1,3,5-triphenyl-Δ^2-pyrazoline, 1,3,4-triphenyl-Δ^2-pyrazoline, and 4-styrylstylbene.

66. Theory of the Luminescence of Impurity Crystal Phosphors

"Concerning the Theory of the Luminescence of Impurity Crystal Phosphors," by N. D. Potekhina; Moscow Optika i Spektroskopiya, Vol 8, No 6, Jun 60, pp 832-838

Williams's method for the calculation of spectra of crystal phosphors is subjected to analysis on the basis of a quantum-mechanical consideration of the Na Cl-Ag phosphor. It is shown that the energy of repulsion determined according to Williams for the excited state corresponds to a sum of the S-energy and the exchange energy and does not include, as distinguished from the basic state, the energy of Coulomb overlapping.

It was thus established that the method of Williams considers correctly the displacement of the excited state of the impurity ion in the crystal field. The calculation that has been carried out can also be regarded as proof that the $4d^{10}$-$4d^9 5p$ transition in silver ions contained in the NaCl-Ag phosphor is responsible for the luminescence bands.

67. Magnesium-Chromium-Copper Ferrites for the Lowest Section of the Ultrahigh Frequency Range

"Magnesium-Chromium-Copper Ferrites for the Lowest Section of the Ultrahigh Frequency Range," by A. S. Khlystov and E. M. Smokotin, Siberian Physico-Technical Institute, Tomsk State University imeni V. V. Kuybyshev; Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy - Fizika, No 2, Apr 60, pp 157-160

The effect of the addition of copper on the ultrahigh frequency characteristics of the magnesium-chromium ferrite $Mg\ Fe_{1.36}Cr_{0.64}O_4$ was investigated. It was established that substitution of magnesium with copper to the extent of 20 molar percent reduces the width of the curve of ferromagnetic resonance up to 150 oersted, while the other characteristics of the magnesium-chromium ferrite remain unchanged. It is proposed that ferrites be prepared which may be synthesized at a relatively low temperature $(1,200°)$ and will exhibit a narrow resonance line. Such ferrites would be suitable for application in the decimeter radiowave range.

Radar

68. Accuracy in Recording Meteors by Radar Examined

"On the Accuracy of Measuring the Parameters of a Radar Designed for Meteor Observations," by Ye. I. Fialko; Moscow, Radiotekhnika, Vol 15, No 6, Jun 60, pp 67-69

The article examines variations in the number of recorded meteors due to the instability of the parameters of a radar for the case of both high- and low-sensitivity radar systems. It is found that the permissible change in parameters of the radar for a low-sensitivity system is a half order less than for a high-sensitivity system. Permissible change in parameters depends essentially on the distribution of meteor bodies by mass.

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<u>Ultrasonics</u>

69. . <u>Ultrasonic Generators</u>

"Standardization of Ultrasonic Generators and Transducers,"
by V. N. Shchepetov; Moscow, <u>Standartizatshiya</u>, No 7, Jul 60,
pp 20-24

The article contains the following passages:

Equipment for specialized types of ultrasonic processing up to the
present time was generally designed without any unified plan by a multi-
plicity of scientific-research institutes, design bureaus, and industrial
plants. Each such organization, in building ultrasonic equipment, would
design and manufacture most of the components all anew. The equipment
thus built had low exploitational indexes and diversified parameters and
construction.

"Only recently has ultrasonic equipment production been organized on
a small series basis. There is no coordination on the matter of general
specialization or the manufacture of widely used electrical components
among the plants producing this equipment. Several cases of manufacturing
similar equipment at different plants are known. As a consequence of this,
the ultrasonic generator (UZM-10) of the Leningrad Plant for High-Frequency
Equipment cannot operate with the magnetostrictive transducers intended
for operation with the generator UZG-10 manufactured at the Moscow plants,
although the input power and frequency of both generators are about the
same and both generators are intended for intensification of the same
processes.

"The requirements of industry with respect to equipment and fittings
for ultrasonic processing are not fully satisfied at the present time.
The volume of processing with the aid of ultrasonic oscillations should
increase several dozen times in 1965 as compared to 1959, if the produc-
tion of specialized equipment attains the required level at that time.
On the basis of our calculations, more than 50,000 generators and more
than one million transducers, valued at about one billion rubles, have
to be manufactured to attain this goal.

"For the first time, the tentative standard 'Ultrasonic Tube Gene-
rators. Their Rated Power Output and Frequencies,' has been worked out
at the Electrical Technology Laboratory of the All-Union Scientific-
Research Institute for Standardization of Machinery."

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70. Ultrasound Absorption in Metals

"A New Type of Oscillations of the Ultrasound Absorption
Coefficient in Metals in a Magnetic Field," by A. A. Galkin,
K. A. Kaner, and A. P. Korolyuk, Institute of Radiophysics
and Electronics Academy of Sciences Ukrainian SSR, Moscow,
Doklady Akademii Nauk SSSR, Vol 134, No 1, Sep 60, pp 74-76

It is shown that under certain conditions, the variation of the
absorption coefficient of a metal in a magnetic field has a resonance
character. The oscillations of the absorption coefficient are not
sinusoidal, as previously assumed (V. L. Gurevich, ZhETF, 37, 71 [1959];
A. A. Galkin and A. P. Korolyuk, ZhETF, 37, 310 [1959]; 38, 6 [1960];
D. H. Reneker, Phys. Rev., 115, 303 [1959]. The curve of the absorption
coefficient exhibits sharp maxima, while the minima are wide and blurred.

IV. ENGINEERING

Automatic Control Engineering

71. Contactless Telemetering System

"Discrete System of Telemetering Utilizing Contactless Devices of Remote Control and Remote Signaling," by N. I. Kalatozishvili, G. I. Nadiradze, and R. P. Megrelishvili, Institute of Electronics, Automation, and Telemechanics, Academy of Sciences Georgian SSR; Tbilisi, Soobshcheniya Akademii Nauk Gruzinskoy SSR, No 3, Mar 60, pp 325-327

Recent development of Soviet contactless remote control and remote signaling devices has opened up great possibilities for their application in the field of telemetry. The main feature of these devices is the continuity of operation, as contrasted with the contact-type devices which operate only during a change in the state of the controlled object. The contact-type remote control devices, which have great industrial value, are not well suited for general telemetry.

The described telemetering system converts continuously measured quantities into discrete values, after which they are fed to the input end of the device. To reduce the number of distributor elements, the decimal system of counting is converted into the binary system with the aid of a special decoder.

The telemetering system consists of the following units: transmitter, receiver, and remote control -- remote signaling device. The principal merit of this telemetering system is that it does not require any special communication channel. This system is also immune to general errors of telecommunication, and is practically independent of the condition of the channel of communication. Any desired accuracy can be attained by proper selection of the number of discrete points in the measured range.

A final refinement of this telemetering system is now being carried out, which consists mainly in replacing a few contact-type relays with the contactless elements.

72. Computers and Automatic Control

"Application of Conjugate Systems in Certain Problems of Automatic Control," by G. V. Savinov, Chair of Applied Mechanics, Moscow University; Moscow, Vestnik Moskovskogo Universiteta, Seriya 1, Matematika, Mekhanika, No 2, Mar/Apr 60, pp 72-77

Employment of analog computers for constructing external influences, transforming the system into a given position at a given time, is considered.

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Electrical Engineering

73. A 500-KV Power Air Circuit Breaker

"The VV-500 Air Circuit Breaker for Operation at 500 KV," by
R. Ye. Rotblyut, Moscow, Byulleten' Tekhniko-Ekonomicheskoy
Informatsii, No 3, 1960, pp 29-31

A power air circuit breaker with breaking capacity of 20,000 Mva
for use on 500-kv power lines has been built at the "Uralelektroapparat"
Plant. The circuit breaker was designed at the All-Union Electrical
Engineering Institute imeni V. I. Lenin and is intended for installation
on open-air substations of the power line connecting the Stalingrad
Hydroelectric Power Plant with Moscow. The breaker was tested for con-
tinuous operation at ambient air temperatures from -40°C to +35°C.

This air circuit breaker has three identical poles which are
mechanically independent of each other. It has provision for automatic
or remote control of any pole separately, or of the three poles simulta-
neously. A grounded carriage with two cylindrical containers 720 mm
in diameter and 9.5 m long holds compressed air at 21 atm, and serves
as the base for each of the poles. The breaker has automatic reclosing
facilities.

The operating specifications of the VV-500 circuit breaker are as
follows: rated current -- 2,000 amp; maximum short-circuit current --
58.8 ka; switch-on time -- 0.24 sec; disconnect time -- 0.07 sec; over-
all dimensions -- 9.5 X 4 X 12 m; weight -- 56 tons.

Mechanical Engineering

74. Elastic Confinement of Free Vibrations

"On the Motion of a Vibrator Resting Freely On an Elastic
Limiter," by S. A. Osmakov and O. A. Savinov, Leningrad;
Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh
Nauk, Mekhanika i Mashinostroyeniye, No 3, May/Jun 60, pp 3-11

The problem of the motion of a vibrator resting freely on an absolutely
rigid limiter has been treated by Bespalova (Izv.AN.SSSR,OTN, No 5, 1957)
and Barkan (Zhurnal Tekhnicheskoy Fiziki, Vol 25, No 13, 1955). This work
considers the periodic stable motions of a vibrator with periodic detach-
ment from an elastic limiter, and determines the parameters of a system
in which such motions can take place.

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75. Natural Rotor Vibrations and Lubrication Collapse

"On the Natural Vibrations of a Rotor On Sliding Bearings,"
by V. I. Olimpiyev, Central Scientific-Research Boiler Turbine
Institute, Leningrad; Moscow, Izvestiya Akademii Nauk SSSR,
Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye,
No 3, May/Jun 60, pp 12-16

Coefficients of stability computed for lubricating films are used
in the investigation of the natural vibrations of a rotor on sliding
bearings, with both reactive forces as well as seizing moments taken into
account. In certain cases, the corrections introduced for the latter
moments are appreciable.

76. Rapid Transverse Loading of Cylindrical Shell

"On the Loss of Stability of a Cylindrical Shell Under Dynamic
Loading," by Yu. I. Kadashevich and A. K. Pertsev, Leningrad;
Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh
Nauk, Mekhanika i Mashinostroyeniye, No 3, May/Jun 60, pp 30-33

The effect of a uniformly distributed transverse dynamic loading on
a cylindrical shell is considered, whereby the inertial effects of both
the development of hollows and axisymmetrical contraction are taken into
account. This affords the possibility of using the obtained system of
equations of motion for a more rapid application of loads than that
considered in an earlier work by Agamirov and Vol'mir (Izvestiya AN SSSR,
OTN, Mekhanika i Mashinostroyeniye, No 3, 1959).

77. Solution of Complex Problem of Half-Plane With Nonsymmetrically
Positioned Openings

"On the Stresses In a Half-Plane With Weight and Weakened
By Two Circular Nonsymmetrically Positioned Openings," by
L. N. Kisler, Institute of Mechanics Academy of Sciences
USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye
Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 3,
May/Jun 60, pp 34-42

The problem of stresses in a half-plane with two circular openings,
the centers of which are located on the real axis has been solved by
D. I. Sherman (Prikladnaya Matematika i Mekhanika, Vol 15, No 3, 1951;
Trudy Instituta Fiziki Zemli AN SSR, No 2, 1959). Where the centers of
the openings are on the real axis, however, the sought-for functionals,
designated here by α_n and β_n, may, from the outset, be considered real,
and the coefficients of the infinite system to which the problem is re-
duced are also real. In this article, such a simplification was not
possible; thus all operations and formulas have a different and more com-
plex form.

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78. Elastic Equilibrium of Semi-Infinite Anisotropic Plate

"On the Elastic Equilibrium of a Semi-Infinite Anisotropic Plate With Reinforced Edge," by A. A. Galasi, Uzhgorod; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 3, May/Jun 60, pp 43-48

This work considers the generalized two-dimensional stress condition and bending of a semi-infinite anisotropic plate reinforced along the edge by an infinitely long thin elastic rod of constant rigidity. It is assumed that at each point of the plate there is a plane of elastic symmetry parallel to the central plane. The method used here to determine the stress state can also be applied for the case of a semi-infinite isotropic plate with analogous reinforcement.

79. Bending of Circular Thin-Walled Tubes

"Bending of Circular Thin-Walled Tubes in the Region of Large Elastic Dislocations," by D. L. Kostovetskiy, Central Scientific-Research Boiler-Turbine Institute, Leningrad; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 3, May/Jun 60, pp 49-54

The bending problem is considered in the region of large elastic dislocations of circular thin-walled tubes of circular cross section in the presence of an internal or external pressure. A tube with a straight-line axis is considered as a partial case. The solution is mapped by means of the dynamic method. The dependence of the change of curvature of the centerline on the bending moment is illustrated graphically. The obtained solution is compared with a linear solution (small dislocations), and the limits of application of the linear solution are explained.

80. Influence of Body Boundaries on Development of Cracks in Brittle Fracture

"On the Influence of the Boundaries of a Body on the Development of Cracks in Brittle Fracture," by G. I. Barenblatt and G. P. Cherepanov, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 3, May/Jun 60, pp 79-88

The development of cracks in the vicinity of the boundaries of a body has certain peculiar characteristics. In contrast to the development of isolated cracks in an infinite medium, the transition through a certain critical load is always accompanied by an instability connected with an

instantaneous formation of surface cracks. The origin of these critical loads is thus a primary problem. This work considers certain more typical problems of cracks in finite bodies. The solution is obtained by the method of successive approximations.

81. Loading and Unloading Waves in Elastic-Plastic Media

"Propagation and Interaction of Loading and Unloading Waves in Elastic-Plastic Media," by G. M. Lyakhov and N. I. Polyakova, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 3, May/Jun 60, pp 99-108

This work considers the propagation, reflection, and refraction of nonstationary plane loading and unloading waves in elastic-plastic media within a Lagrange mass-time coordinate system where the loading and unloading of the media are linearized.

82. Motion of Thin Blunt Cone at Mach-Six

"The Motion of a Thin Blunted Cone Under a Low Angle of Attack At High Supersonic Velocity," by V. V. Lunev, I. N. Murzinov, and O. N. Ostapovich, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 3, May/Jun 60, pp 121-125

The influence of blunting on the pressure distribution along the generatrices of thin blunted cones is studied for the case of low attack angle at high Mach numbers. A qualitative flow diagram is plotted on the basis of results obtained by an approximation method. Plotted curves give a comparison of experimental data derived here for Mach-6 and a four-degree attack angle and data obtained by M. H. Bertram (JAS, No 9, 1956) for Mach-6.85 and a zero attack angle. A law of similarity is also derived, which represents a generalization of a law for zero attack angle presented by G. G. Chernyy (DAN SSSR, Vol 114, No 5, 1957).

83. Two-Dimensional Flow Of Liquid Through Porous Walls

"Potential Flow of a Liquid Entering a Two-Dimensional
Channel Through Porous Walls," by Yu. F. Dityakin and V. I.
Yagodkin, Moscow; Moscow, Izvestiya Akademii Nauk SSSR,
Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye,
No 3, May/Jun 60, pp 126-131

The treatment here assumes the flow through the porous wall to be constant. General formulas are derived for the velocity of flow at any point of a two-dimensional pentagonal plane. Particular emphasis is given to the formulas and numerical calculation of the velocity distribution along the porous walls, which is necessary for a determination of the boundary layer at the wall.

V. MATHEMATICS

84. <u>Synthesis of Finite Automata by Algorithms</u>

"On an Algorithm for Synthesis of Abstract Automata," by
V. M. Glushkov; Kiev, <u>Ukrainskiy Matematicheskiy Zhurnal</u> Vol 12,
No 2, May 60, pp 147-156 .

A simple and practically convenient algorithm for synthesis of finite
automats after events represented by them is described in this paper.

The term "finite automat" is taken in the sense of Moore; and the
term "event", in the sense of Kleene. As distinct from other algorithms,
the synthesis algorithm described is composed so as to represent several
events at once.

85. <u>Residual Terms of Fourier Series</u>

"On the Residual Terms of Expansions Into Fourier Series .
Expressed by Jacobi Polynomials of Functions, the rth Order De-
rivative of Which Satisfy Lipschitz's Condition," by B. M.
Yakhnin; Kiev, <u>Ukrainskiy Matematicheskiy Zhurnal</u> Vol 12, No 2,
May 60, pp 196-204

In this article the author considers expansions of the functions of
class $MW^{(r)} H^{(a)}$ into Fourier series by Jacobi polynomials. A theorem is
proved which makes it possible to judge the asymptotical properties of the
residual terms of the respective expansions.

86. <u>Boundary Value Problem for an Infinite System of Ordinary Differential
Equations</u>

"Solution of Boundary Value Problem for an Infinite System
of Ordinary Differential Equations," by O. A. Zhautykov; Kiev,
<u>Ukrainskiy Matematicheskiy Zhurnal</u> Vol 12, No 2, May 60, pp 157-
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The author considers the problem of finding a solution of the infinite
system of ordinary differential equations:

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$$\frac{dx_k}{dt} = w_k(t, x_1, x_2, \ldots) \qquad (k = 1, 2, \ldots) \qquad (1)$$

satisfying the conditions

$$x_k(t_k) = a_k \qquad (k = 1, 2, \ldots),$$

where t_1, t_2, ... are points lying in the region of variation of the variable t; $a \leq t \leq b$

The stated problem will be called the boundary problem for the infinite system of ordinary differential equations.

On the basis of Picard's method of successive approximations, the author proves the theorem of existence and singularity of the solution of the stated problem. The properties of the solution of the problem are established, as well as the conditions on satisfaction of which the solution of the boundary problem for an infinite system of differential equations (1) is reduced to the solution of such a problem for a finite system of differential equations.

87. <u>Numerical Integration of Ordinary Differential Equations</u>

"New Method for the Numerical Integration of Ordinary Differential Equations," by P. S. Bondarenko; Kiev, <u>Ukrainskiy Matematicheskiy Zhurnal,</u> Vol 12, No 2, May 60, pp 118-131

The author introduces the concept of an h_n-approximate solution of a problem with initial conditions for an ordinary differential equation of the first order and derives the integral equation of the error of this approximate solution.

The segment of the existence of a real h_n-approximate solution is established. An iterative process is proposed for the solution of the integral equation of the error, and the sufficient conditions for its convergence are established. The author shows that the proposed iterative process of finding the error of the h_n-approximate solution of a problem with initial conditions for an ordinary differential equation of the first order makes it possible to find its numerical solution with any given precision and to determine the segment of existence of a solution of this problem with sufficient precision.

88. Mixed Problems for a Parabolic Equation with Discontinuous Coefficients

"Certain Properties of the Solutions to Mixed Problems for a Parabolic Equation with Discontinuous Coefficients," by L. I. Kamynin and V. N. Maslennikov, Mathematics Institute imeni V. A. Steklov, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSR Vol 133, No 5, Aug 60, pp 1003-1006

In recent times many works have been devoted to the consideration of boundary problems for an equation of the second order with discontinuous coefficients (see, for example, O. A. Oleynik, DAN, Vol 124, No 6, 1959, O. A. Oleynik, UMN, Vol 14, No 5 (89), 1959, and I. A. Shishmarev, DAN, Vol 131, No 2, 1960).

In the present work, apriori estimates are derived for the solutions of various mixed problems for a parabolic equation with discontinuous co-efficients on the basis of which theorems of uniqueness and correctness are proved. It is noted that the methods employed by the authors are developments from O. A. Oleynik, Matem. sborn., Vol 30 (72), No 3, 1952.

89. Boundary Value Problems for Ordinary Differential Equations of the Second Order

"Numerical Solution of Linear Boundary Value Problems for Ordinary Differential Equations of the Second Order," A. G. Anisimov, Zaporozh'ye Machine Building Institute; Tbilisi Soobshhahjya Akademii Nauk Gruzinskoy SSR Vol 24, No 4, Apr 60, pp 385-389

In the present work a method is given for the numerical solution of a boundary value problem for the equation

$$y" + \varphi(x)y = f(x) \tag{1}$$

where $\varphi(x)$ and $f(x)$ are continuous functions together with their first four derivatives on the segment defined by the inequality

$$a \leq x \leq b.$$

Three types of boundary conditions arise during the consideration of equation (1). A method is presented for the solution of (1) for the boundary conditions.

$$y(a) = p, \quad y(b) = q \tag{2}$$

although the method has a general character.

The method proposed is sufficiently simple and may be successively applied in practice. It is based on the utilization of certain recurrent formulas introduced in the work. The obtained process converges.

90. Expansion of Infinite Systems of Differential Equations

"Expansion in terms of Eigenfunctions of Infinite Systems of Differential Equations in the Self-Conjugate and Nonself-Conjugate Cases," by F. S. Rofe-Beketov; Matematicheskiy Sbornik, Vol 51 (93), No 3, Jul 60, pp 293-342

The formulas of H. Weyl concerning the expansion of a self-conjugate boundary problem on the half axis in terms of eigenfunctions are well known (see H. Weyl, "On ordinary differential equations with singularities and the associated expansions of arbitrary functions," Math. Ann., Vol 68, 1910, pp 222-260); here $q(x)$ and A are real).

$$j[y] \equiv -y'' + q(x)y = \lambda y \qquad (0 \leq x < \infty), \qquad (1)$$

$$y'(0) - Ay(0) = 0.$$

These formulas have the form:

$$E_f(\lambda) = \int_{0}^{\infty} f(x)\omega(x,\lambda)dx, \quad f(x) = \int_{-\infty}^{\infty} E_f(\sqrt{\lambda})\omega(x,\sqrt{\lambda})d\rho(\lambda),$$

$$\int_{-\infty}^{\infty} E_f(\sqrt{\lambda}) E_g(\sqrt{\lambda}) d\rho(\lambda) = \int_{0}^{\infty} f(x)g(x)dx, \qquad (2)$$

where $\omega(x,\lambda)$ is the solution of the equation $j[\omega] = \lambda^2 \omega$ for the conditions $\omega(0,\lambda) = 1$, $\omega'(0,\lambda) = A$, and $\rho(\lambda)$ is a certain nondecreasing function, the spectral function of Problem (1). (The spectral function may and may not be unique).

V. A. Marchenko has a general formula for the expansion of (2) for the nonself-conjugate case, where $q(x)$ is an arbitrary complexvalued function and A is any complex number. For this case the spectral function $\rho(\lambda)$ is proved to be a generalized function in a certain space Z of basic functions.

In the present work these results are generalized for the case of a nonself-conjugate boundary problem for an infinite system of differential equations of the second order on the half axis. In this case the role of a generalized function is played by a spectral matrix, the elements of which are generalized functions. Along with construction of the spectral matrix, the inverse problem is investigated in the present work, namely, the reduction of the system according to its spectral matrix. In addition, a spectral matrix representation is obtained for the case of self-conjugate boundary problems in the form of a nondecreasing matrix distribution function.

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91. <u>Nonlinear Problem concerning Forced Oscillations of a String</u>

"Concerning the Existence and Uniqueness of the Periodic Solu~ tion to a Nonlinear Problem Concerning Forced Oscillations of a String," by V. N. Karp, Odessa Polytechnic Institute; Moscow, <u>Doklady Akademii Nauk SSSR,</u>Vol 133, No 3, Jul 60, pp 515-518

The existence and uniqueness is proved for a periodic solution of the nonlinear differential equation

$$\frac{\partial^2 u}{\partial t^2} - a \frac{\partial^2 u}{\partial x^2} = \phi(x, t) + \mu f(x, t, u, \frac{\partial u}{\partial t}),\tag{1}$$

satisfying the conditions

$$u(0, t) = u(1, t) = 0,\tag{2}$$

$$u(x, 0) = u(x, 1),$$

$$\frac{\partial u(x, 0)}{\partial t} = \frac{\partial u(x, 1)}{\partial t},\tag{3}$$

under the assumptions that μ is a small parameter and that the constant coefficient a, is equal to p/q, where $p = 2k + 1$ $(k = 0, 1, \ldots)$ and $(p, q) = 1$.

The sought-for function $u(x, t)$ must be periodic with respect to the argument t having a period equal to one, and continuous at the same time with its partial derivatives of the two first orders in the closed region

$$\overline{D} = D\binom{0 \leq x \leq 1}{0 \leq t \leq 1}.$$

92. <u>Numerical Integration of Ordinary Differential Equations</u>

"Ordinate Formulas for the Numerical Integration of Ordinary Differential Equations of the First Order," by S. S. Tokmalay- eva; Moscow, <u>Vychislitel'naya Matematika</u>, No 5, Aug 59, pp 3-57

The present work is devoted to a review of the difference formulas for the numerical integration of ordinary differential equations. Known dif- ference formulas are brought to a form convenient for calculation on a universal high-speed computer with floating point arithmetic. The known

difference formulas, for the numerical integration of ordinary differential equations (Adams, Cowell, and others) for manual calculation, are made use of in the form of series in terms of differences of increasing order with decreasing coefficients.

Control during calculations by such formulas is arrived at by smooth change of the last considered difference, and greater facilitation is arrived at during calculation by the gradual decrease of differences with increase of order. In addition, operations with small numbers guarantee a small amount of errors.

93. Approximate Calculation of Multiple Integrals

"Concerning the Approximate Calculation of Multiple Integrals," by N. Ya. Vilenkin; Moscow, Vychislitel'naya Matematika, No 5, Aug 59, pp 58-71

A large number of works has been devoted to the approximate calculation of definite integrals. This theory is closely related with the theories of orthogonal polynomials, interpolation theories, and other chapters of constructive analysis. Significantly fewer works are devoted to the theory of the approximate calculation of multiple and in particular double integrals.

In the present work problems are considered associated with the approximate calculation of multiple integrals and several new formulas are presented for such a calculation.

94. Spheroidal Wave Functions

"On the Asymptotes of Spheroidal Wave Functions," by L. N. Karmazina; Moscow, Vychislitel'naya Matematika no 5, Aug 59, pp 72-78

Solutions of the differential equation

$$\frac{d}{dz}[(1-z^2)\,y'(z)] + [\Lambda + \gamma^2(1-z^2) - \frac{\mu^2}{1-z^2}]\,y(z) = 0 \qquad (1)$$

are known as the elongated spheroidal wave functions $y(z, \Lambda, \gamma^2, \mu^2)$.

It is assumed that the values of the variable z as well as of the parameters Λ, γ and μ are real.

That value $\Lambda = \Lambda_n$, for which equation (1) has bounded solutions together with the derivatives at the singular points $z = 1$ and $z = -1$, are called eigenvalues and the corresponding bounded solutions are the eigenfunctions. The eigenfunctions $y(z, \Lambda_n, \gamma^2, \mu^2)$ are either even or odd, that is, they satisfy one of the conditions

$$y(0, \Lambda_n, \gamma^2, \mu^2) = 0,$$
$$y'(0, \Lambda_n, \gamma^2, \mu^2) = 0. \qquad (2)$$

For real γ and μ the eigenvalues Λ_n are real and $\Lambda_n \to \infty$ for $n \to \infty$.

The purpose of the present work is to obtain an asymptotic representation for the fundamental system of solutions of the equation (1) for $\Lambda \to \infty$, $-1 < z < 1$.

The asymptotic representation of the eigenvalues and eigenfunctions for $\mu = 1$ were obtained in the work by M. G. Belkina, "Asymptotic representation of spheroidal functions with azimuth index m = 1," Doklady Akademii Nauk SSSR, Vol 114, No 6, 1957.

95. Characteristics of Certain Stochastic Processes

"Calculation of the Characteristics of Certain Stochastic Processes by the Monte Carlo Method," by D. I. Golendo; Moscow, Vychislitel'naya Matematika No 5, Aug 59, pp 93-108

The method of random trials, or, as it sometimes is called, the Monte Carlo method, may be successfully applied to the study of stochastic processes of physical phenomena. Particularly good results have been obtained

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during investigation of an intranuclear cascade, calculation of the diffusion of gamma rays, and in a series of other processes. The utility of the application of the Monte Carlo method consists of the possibility of its application to the calculation of stochastic processes of any complexity. In fact, the latter are always such that they may be separated into elementary Markoff processes, the probability characteristics of which are known. This gives the possibility of using the method of random trials to obtain a probability analog of this process, and finally to obtain a probability model of the entire stochastic process. By repeated repetition of this procedure it is possible to obtain the statistical distribution of the parameters of the investigated probability process.

In the present work methods are presented for the calculation of the statistical characteristics of one of the random branching processes often encountered in certain physical phenomena. The reader may find a convenient presentation of a physical chart of the considered process in the work A. A. Varfolomeyev, D. I. Golenko, and G. A. Svetlolobov, "Characteristics of Electromagnetic Cascades in Photoemulsions Taking Into Account the Influence of the Medium on the Process Under Investigation," Dokl. AN SSSR. Vol 122, No 5, 1958.

96. Self-Adjoint Extensions of Commuting Operators

"Self-Adjoint Extensions of a System of Commuting Symmetric Operators," by R. S. Ismagilov, Moscow State University imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 133, No 3, Jul 60, pp 511-514

A linear topological space Φ is considered in which commuting linear continuous operators A and B are assumed to act; let H be the Hilbert space, obtained from Φ by the supplement according to the continuous nondegenerative scalar product (x,y), where the operator $\bar{A}$ (closure of operator A in H) is self-adjoint in H, and the operator B is symmetric. Does there exist a self-adjoint extended operator B commuting with $\bar{A}$? (Self-adjoint operators are called commuting if their spectral families commute.) In the present work the solution to that problem is given with applications to representations of positive definite functionals.

97. Subsequences of Hermite and Laguerre Polynomials

"Concerning Subsequences of the Polynomials of Hermite and Laguerre," by Yu. A. Kaz'min; Moscow, Vestnik Moskovskogo Universiteta, seriya 1, Matematika, Mekhanika No 2, Mar/Apr 60, pp 6-9

The problem concerning the completeness of subsequences of Hermite polynomials in the space of functions analytical in the circle $|z| < R$, $0 < R < \infty$ is considered.

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The corresponding problem for Laguerre's polynomials is resolved in addition.

98. Derivative of an Entire Function Studied

"Concerning the Distribution of the Zeros of the Derivative of an Entire Function With Zeros Close to the Real Axis," by I. V. Ostrovskiy, Khar'kov State University imeni A. M. Gor'kiy; Moscow, Doklady Akademii Nauk SSSR Vol 130, No 5, Feb 60, pp 973-976

The classical theorem of Laguerre reads: If a real entire function $f(z)$ has only real zeros and is represented in the form

$$f(z) = e^{-\gamma^2} P(z), \tag{1}$$

where $\gamma \geq 0$, $P(z)$ is an entire function of type 1, then all the derivatives of $f(z)$ also have only real zeros and are also represented in the form (1).

Entire functions of class A are considered in the present work. It is understood that this class consists of entire functions with the zeros $\{a_k\}_{k=1}^{\infty}$, satisfying the condition $\sum_{k=1}^{\infty} |\operatorname{Im}(a_k^{-1})| < \infty$, the meaning of which is included in the fact that the zeros of the function "not sufficiently quickly leave" the real axis. The following theorem is established which may be considered as an analog of Laguerre's theorem.

Theorem. If the entire function $f(z)$ belongs to the class A and is represented in the form

$$f(z) = e^{Q(z)} P(z), \tag{2}$$

where $Q(z)$ is an entire function of the exponential type satisfying the condition

$$\int_{-\infty}^{\infty} \frac{\ln^+ Q(t)}{1+t^2}\, dt < \infty, \tag{3}$$

and $P(z)$ is and entire function for which

$$\int_{1}^{\infty} \frac{\ln^+ \ln^+ M(t, P)}{t^2}\, dt < \infty, \tag{4}$$

then all the derivatives of $f(z)$ also belong to the class A and also are representable in the form (2).

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99. <u>Nonlinear Extremal Problems Considered</u>

"On One Class of Nonlinear Extremal Problems," by Ye. G. Gol'-shteyn; Moscow, <u>Doklady Akademii Nauk SSSR</u>, Vol 133, No 3, Jul 60, pp 507-510

The extremal problem consisting of maximization of the function

$$F(x_1, x_2, \ldots, x_n) = \sum_{j=1}^{n} f_j(x_j) \tag{1}$$

is investigated, the variables of which satisfy linear conditions of the form

$$\sum_{j=1}^{n} \alpha_{ij} x_j = b_i \quad i = 1, 2, \ldots, m; \tag{2}$$

$$\alpha_j \leq x_j \leq \beta_j, \quad J = 1, 2, \ldots, n. \tag{3}$$

It is presupposed that $f_j(x)$ $(j = 1, 2, \ldots, n)$ are continuous, piece-wise smooth, upward convex functions. Several of the numbers $\alpha_j(\beta_j)$ may coincide with $-\infty$ (∞).

The problem (1)-(3) is the essential extension of the generalized problem of linear programming, contained, as is known, in the search for the maximum (or minimum) of a linear function, with restrictions of the type (2), (3) being imposed on the variables. This problem is denoted briefly as problem I.

The vector $X = (x_1, x_2, \ldots, x_n)$ satisfying the conditions (2), (3) is called the plan of Problem I. The plan transforming function (1) into the maximum is called the optimal plan of Problem I, or its solution.

On the basis of numerical analysis of the extremal problem an ordinary criterion permitting verification of its plan at optimization is prepared. In the present work the necessary and sufficient conditions of optimization of Plan I are formulated.

Antibiotics

100.   Toxin Adsorption of Antibiotics

"On the Adsorption Properties of Toxins in Relation to Anti-
biotics," by V. N. Derkach, Chair of Microbiology, Ukrainian
Institiute for the Advanced Training of Physicians; Moscow,
Antibiotiki, Vol 5, No 3, May/Jun 60, pp 116-119

Investigations were conducted to determine the adsorption properties
of the botulin, tetanus, and diphtheria toxins in relation to the antibi-
otics chlortetracycline, levomycetin, and sanazin. Different doses of the
toxins were mixed with different doses of the antibiotics. Similar mix-
tures of the toxins and antibiotics in physiological solution were used
as controls. The antibacterial activity of the mixtures was determined
in Petri dishes.

The investigations established the following: (1) diphtheria, botu-
lin, and tetanus toxins possess adsorptive properties in relation to chlor-
tetracycline; (2) sanazin is adsorbed by the diphtheria and botulin toxins,
but not by the tetanus toxin; (3) levomyctin is adsorped by the diphtheria
and tetanus toxins, but is not adsorped by the botulin toxin; and (4) the
detoxicating properties of the antibiotics were not impaired by adsorption.

101.   Effect of Antibiotics on Bacillus pyocyaneus

"Effect of Different Combinations of Antibiotics on Strains of
Bacillus pyocyaneus," by Ye. Horvath, L. Vaczi, G. Szabo, F.
Hernadi, Orvosi Het. (Hungary), 1959, 15, 541-544 (from Med-
itsinskiy Referativnyy Zhurnal, Vol 4, Section 3, No 2, Feb 60,
Abstract No 697, by I. N. Ivanov)

"The sensitivity of 100 strains of Bacillus pyocyaneus isolated from
patients to different antibiotics and different combinations of antibiotics
was investigated.. The investigation was conducted in vitro in a liquid
medium; the sensitivity of the antibiotics was determined by the Sibal'skiy
method. The best effect was produced by polymyxin, with 71 percent of the
strains of Bacillus pyocyaneus exhibiting sensitivity to the antibiotic;
25 percent were sensitive to neomycin. The overwhelming majority of the
strains of Bacillus pyocyaneus (81-88 percent) were resistant to the other
antibiotics when separately applied (terramycin, aureomycin, streptomycin,
chloromycetin). The most effective combination of antibiotics was that
of polymyxin with terramycin: 65.3 percent of the strains exhibited sensi-
tivity to this combination of the antibiotics."

102. Tularemia Pathogen Preserved in Frog Organism

"The Duration of Preservation of the Tularemia Pathogen in the
Rana temporaria Frog Organism," by M. M. Kirvel', Tr. Smolen-
skogo Med. In-ta (Works of the Smolensk Medical Institute,),
No 10, 1958, pp 65-71 (from Referativnyy Zhurnal--Biologiya,
No 11, 10 Jun 60, Abstract No 48973, by M. Boyarskaya)

"Meadow frogs were infected by the introduction into the saccus endo-
lymphaticus of one milliliter of a one million suspension from a 2-day culture
of highly virulent tularemia strain No 111 on a MacCoy medium washed with
physiological solution. The experimental frogs were sacrificed and examined
for the presence of B. tularense 2, 3, 4, 5, 6, and 7 months after infection.
Macroscopic, specific changes were not observed in the organs of frogs
sacrificed after 2, 4, and 5 months, nor was B. tularense observed in slides
from organs. Tiny, typical necrotic foci and B. tularense on the slides
were seen only in frogs sacrificed during the third month after infection.
Maximum B. tularense proliferation occurs and the most pronounced reaction
of the organism to the introduction of the pathogen develops in the frogs
toward the third month. It was shown that B. tularense can be preserved
in the frog organism for 5 months. B. tularense is completely eliminated
from the frog organism in the sixth month.

"Mice and guinea pigs infected with a suspension of liver and spleen
from frogs sacrificed 2, 3, 4, and 5 months after infection died with mani-
festations of acute tularemia. During the first 2 months, white mice were
successfully infected with the water in which the infected frogs were kept.
The virulence of cultures isolated from the frogs in the third and fifth
months after infection was not changed. The agglutination reaction with
cultures of the initial strain and also with cultures which had remained
in the frog organism for 3-5 months were of equal intensity and had identi-
cal titers. In the author's opinion, the meadow frog is epidemiologically
dangerous as a possible source for the spread of infection both on land
and in water if it is considered that it has a habitat common with warm-
blooded animals--Microtinae."

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103. Role of Fleas in Epidemiology of B. pestis

"Fleas of Domestic Mice and Their Role in the Circulation of
the Plague Microorganism in the Southeast European Part of the
USSR," by D. T. Shiryayev, Tr. Astrakhansk. Protivochumn. St.
(Works of the Astrakhan Antiplague Station), No 2, 1957 (1958),
pp 178-188 (from Referativnyy Zhurnal--Biologiya, No 15,
10 Aug 60, Abstract No 71745)

"This article is a review of domestic literature and reports of anti-
plague institutions concerning the species composition, numerical changes,
and epidemiological significance of fleas of domestic mice along the Caspian
shores and in the area between the Volga and the Urals."

104. Fleas in Astrakhan

"Fleas of Gray Rats (Rattus norvegicus Berken) in the City of
Astrakhan," by Ye. I. Novikova and N. I. Cherinova, Tr. Astrak-
hansk. Protivochumn. St. (Works of the Astrakhan Antiplague
Station), No 2, 1957 (1958), pp 189-197 (from Referativnyy
Zhurnal--Biologiya, No 15, 10 Aug 60, Abstract No 71746, by R.
Kosminskiy)

"During the period 1943-1955 some 3,629 fleas (including 2469 captured
alive from 2,354 wild rats) belonging to seven species were collected from
7,206 rats. Synanthropic species predominated: Ceratophyllus fasciatus
(75.3%), Leptopsylla segnis (15.5%), and Xenopsylla cheopis (8.5%). Changes
of the monthly numerical indexes and the relative number of imago forms
of these flea species on the wild animals differed in different years.
In 1954-1955, X. cheopis was not found in the collections from rats. S.
Fasciatus females with developing eggs were observed in all months of the
year."

105. Antigenic Properties of Anthrax Cultures

"The Antigenic Properties of Anthrax Cultures in Capsular and Noncapsular Forms and the Diagnostic Significance of the Sera Corresponding to Them," by A. V. Mashkov and V. P. Bodisko, Tr. Mosk. N.-I. In-ta Vaktsin i Syvorotok (Works of the Moscow Scientific Research Institute of Vaccines and Sera), No 11, 1958, pp 77-87 (from Referativnyy Zhurnal--Biologiya, No 13, 10 Jul 60, Abstract No 59375, by V. Roykhel')

"The number of capsular forms of B. anthracis on a Gladstone and Fildes medium modified by the authors gradually increased after 3 hours of incubation, reaching a maximum toward the 14th-16th hours, after which the capsule material began to disintegrate. A 2-day virulent anthrax culture was centrifuged and subsequently passed through a Seitz filter. The sterile filtrate was precipitated with alum, and animals were immunized with it twice. After 2 weeks, the intensity of immunity was tested by the introduction of a suspension of the live B. anthracis culture. A high survival rate of the immune animals (mice and guinea pigs) in comparison with the controls was demonstrated."

106. Preparation and Use of Anthrax Allergen

"A Method of Preparing and Using Anthrax Allergen," by E. N. Shlyakhov; Certificate of Authorship [Patent] No 113171, Dated 15 August 58 (from Referativnyy Zhurnal--Biologiya, Now 13, 10 Jul 60, Abstract No 59382, by N. Kamzolkina)

"Second Tsenkovskiy vaccine or STI-1 vaccine was introduced subcutaneously in the groin in different doses to different laboratory animals. Tissue exudate was collected in the preagonal period or immediately after the death of the animal, and was then defibrinated and passed through a Seitz filter. A 0.5% formalin solution was added to the liquid (one to two drops per milliliter). The allergen can be diluted with one to two volumes of physiological solution. An amount of 0.1-0.2 ml of allergen is administered intracutaneously. The reaction to the allergen appears within a few hours and reaches a maximum within a day (reddening, edema, sometimes necrosis)."

107. Distribution of Anthrax Vaccine Traced With Radioactive Indicators

"A Study of the Distribution of Anthrax Vaccine in the Organism by the Use of Radioactive Indicators," by M. M. Agababyan, Tr. Yerevansk Zootekhn.-Vet. In-ta (Works of the Yerevan Zootechnical Veterinary Institute), No 22, 1957, pp 349-350 (from Referativnyy Zhurnal--Biologiya, No 13, 10 Jul 60, Abstract No 59376, by N. Kamzolkina)

"Bacilli of first and second Tsenkovskiy vaccines were cultured on glycerine-peptone agar containing radioactive sulfur in the form of methionine. After the subcutaneous introduction of the tagged vaccines to rabbits, high radioactivity was observed in the blood in the first 2 days; the radioactivity gradually diminished toward the 43d day, but high radioactivity in the liver, spleen, and kidneys was maintained until the 20th day. Radioactivity was observed in the blood of animals to which only radioactive sulfur had been given until the 20th day, but was only one fourth as high by this time. After infection of the immunized rabbits with tagged bacillis, radioactivity in the blood and organs decreased to a minimum on the eighth day."

108. Effect of Antibiotics on B. anthracis

"The Action of Antibiotics on the Anthrax Microorganism," by Ya. Ye. Kolyakov, Sb. Nauchn. Tr. Est. S.-Kh. Akad. (Collection of Scientific Works of the Estonian Agricultural Academy), No 4, 1958, pp 138-147 (from Referativnyy Zhurnal--Biologiya, No 13, 10 Jul 60, Abstract No 59384, by P. Budnitskaya)

"Experimental work by Soviet and foreign authors on the treatment of humans and animals with different antibiotics for anthrax is presented. Penicillin and biomycin are the most prospective. The latter was found to have a prophylactic effect in addition in experiments on mice. The morphological changes which occur due to the effect of antibiotics, in particular the 'pearl necklace' [effect], have differential diagnostic significance."

109. Brucella Vaccine Strain Obtained by Passage Through Amphibia and Reptilia

"Modifiablilty of Brucella and Prospects of Obtaining Vaccine Strains," by V. K. Antonov, Nasledstvennost' i Izmenchivost' Rasteniy, Zhivotnykh i Mikroorganizmov (Heredity and Modifia-bility of Plants, Animals, and Microorganisms), 1959, pp 349-353 (from Referativnyy Zhurnal--Biologiya, No 13, 10 Jul 60, Abstract No 59208, by A. Shevelev)

"The modifiability of Brucella was studied in Amphibia and Reptilia, and also under the action of ultraviolet rays. After passage through the amphibian organism, Brucella ceased to be agglutinated by specific serum and lost virulence for guinea pigs. After 115 generations of Brucella melitensis, had been subjected to ultraviolet irradiation, an increase in the size of the bacteria and an increase in their agglutinability when alive was noted. The presence of O- and H-antigens is assumed in an irradiated culture. After the first irradiation, inhibition of Brucella proliferation occurred, but was replaced in succeeding generations (under prolonged ultraviolet irradiation) by intensified proliferation. At the beginning, irradiation caused an increase and then a loss of agglutinability, which was the re-sult of the transformation of Brucella into an R-form. The latter was observed also in the organisms of naturally infected animals. The R-form Brucella were transformed into S-forms after passage in the amphibian organism for 180 days. After purification of these cultures from the transformed RS-forms (as a result of separation), a number of variants found to be harmless and immunogenic in experiments on guinea pigs and sheep were obtained."

110. Prophylaxis of Experimental Plague

"Application of Dry Streptomycin Aerosols for the Purpose of the Rapid, Prophylaxis of Experimental Plague," by L. N. Makarov-skaya, Rostov-Na-Donu State Scientific Research Antiplague In-stitute and the Chair of Microbiology, Central Institute for the Advanced Training of Physicians; Moscow, Antibiotiki, Vol 5, No 3, May/Jun 60 pp 38-41

Results of the experiments in which guinea pigs and albino mice were used to determine the prophylactic effectiveness of dry aerosols of strep-tomycin in experimental plague are reported. The animals were intranasally infected with the virulent strains of Bacterium pestis 773. Streptomycin in aerosol form was administered to the animals 30 minutes, one, 2, and 3 hours before the infection, and 15 minutes after the infection. The ex-periments established that a single administration of streptomycin in the dry aerosol form prevented the development of the infectious process if administered shortly before or after the animals were infected.

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111. Anti-Whooping Cough Preparation Obtained From Cattle Serum

"Anti-Whooping Cough Preparation From Cattle Serum," by L. I. Tobol'skaya, _Tr. Nauchn. Konferentsiy Gl. Upr. In-tov Vaktsin i Syvorotok M-va Zdravookhr. SSSR_ (Works of the Scientific Conference of the Main Administration of Institutes of Vaccines and Sera, Ministry of Health USSR), No 6, 1957, pp 320-327 (from _Referativnyy Zhurnal--Biologiya_, No 14, 10 Aug 60, Abstract No 69835, by N. Kamsolkina)

"Cattle between the ages of 2 and 4 years were immunized with a 48-hour culture of whooping cough bacillus in the first phase, whooping cough vaccine with 0.3% phenol, natural toxin and anatoxin (a virulent culture was grown for 7-8 days on a potato-glycerine medium with 6-8 percent blood for the formation of toxin). The highest agglutinin titer was observed in animals vaccinated with a live culture (204 800) [sic]; the titer of precipitins and complement-fixing antibodies was identical in all sera. Both antibacterial and antitoxic sera had good protective properties in experiments on mice, especially when introduced intranasally while protecting against infection with a live, virulent culture or from the action of toxin. A 0.3-ml dose of gamma globulin obtained from these sera by the method of precipitation with alcohol in the cold guaranteed 100% survival of mice; the preventive dose of gamma globulin was only one tenth that of the preventive dose of natural sera. Gamma globulin obtained from sera produced in response to a combination of the live culture and the toxin was the most effective. This 'combined' gamma globulin was characterized by weak reactogenicity, which led the author to recommend its clinical testing."

112. Whooping Cough Bacterial Exotoxin

"The Methodology of Determining Exotoxin From Whooping Cough Bacteria," by L. N. Orlova, _Sb. Stud. Rabot. Rostovsk. Med. In-t_ (Collection of Works of Students of Rostov Medical Institute), No 1, 1958, pp 36-38 (from Referativnyy Zhurnal--Biologiya, No 15, 10 Aug 60, Abstract No 69821, by M. Boyarskaya)

"An experiment on the determination of the minimum amount of whooping cough bacteria necessary to obtain exotoxin capable of giving a positive necrotic test was performed on ten albino rabbits. Eleven strains of whooping cough bacteria were tested. Exotoxin was obtained according to the methodology of Trushina-Tomanova. Within 2 hours after the intracutaneous introduction of 0.2 ml of exotoxin to the rabbits, an infiltrate with a hemorrhagic and a white zone, caused by the action of the exotoxin on the nervous and vascular systems, was formed at the injection site. The toxin was completely destroyed at 60° for 30 minutes. When 10 billion microbial cells were used to prepare the exotoxin, a positive intracutaneous test was obtained in one case out of 11; when 60 billion bacteria were used, necrosis was observed in four out of seven cases. The author recommends the latter dose as a minimum for obtaining exotoxin."

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113.   Therapy of Schistosomiasis

"Investigation of Medicinal Substances for the Therapy of Schis-
tosomiasis.   XVI. Experimental Therapy and Toxicity of Sb-58,"
by Liang Yu-i and Ting Kuang-sheng, Acta Physiol. Sinica, 1959,
23, No 2, 158-165 (from Referativnyy Zhurnal--Khimiya, Biologi-
cheskaya Khimiya, No 13, 10 Jul 60, Abstract No 19204, by R.
Ostrovskaya)

"The therapeutic and toxic effects of the preparation Sb-58 synthe-
sized by the reaction of Sb_2O_3 with sodium dimercaptosuccinate were studied.
The intravenous administration of Sb-58 in a total dose of 350 milligrams
per kilogram of body weight to rabbits infected with Schistoscoma japonicum
led to the completed recovery of the animals.   A marked improvement in the
hepatic functions was noted at the same time (tests with bromsulphalein).
The administration of 30 milligrams per kilogram of body weight of Sb-58
to dogs (single administration intravenously) and monkeys (repeated intra-
muscular administrations) had no effect on the respiration, blood circu-
lation, and electrocardiograph of the animals.   Doses of 150-200 milligrams
per kilogram of body weight were toxic to the dogs.   The toxicity of the
preparation was diminished when sodium dimercaptosuccinate or unithiol were
administered subcutaneously."

Oncology

114. Studies of Cancerogenic Activity of Soviet Tobacco Products

"On the Cancerogenic Activity of Tobacco Tars, (Results of Experiments on Animals)," by L. A. Gritsyute and A. I. Mironova, Laboratory of Experimental Oncology, Institute of Oncology, Academy of Medical Sciences USSR; Moscow, Voprosy Onkologii, No 8, 1960, pp 25-33

Tar extracts and pyrolysate of the more popular brands of cigarettes in the USSR (Belomorkanal, Avrora, and makhorka) were used on 605 mice, 139 rats, and 12 rabbits to investigate their cancerogenic activity. Mice and rabbits were smeared with these substances while rats received subcutaneous injections. Of the animals which survived the 10-month experiment, 8 mice (out of 238) developed tumors at the site of lubrication, one rat (out of 82) developed a sarcoma, and multiple papillomas were observed in 2 rabbits (out of 8). The results of the experiments show the biological effect of tobacco tars to correspond to data of physical analysis. The physical analysis showed that the tobacco tars contained a small quantity of 3-4 benzpyrene (from 0.00003 to 0.0001% to tar weight) and the pyrolysate contained 0.00024%. Because of the slight cancerogenic effect, one can suppose that, besides 3-4 benzpyrene, tobacco tars do not contain any significant quantities of any other cancerogenic substances.

115. Artificially Induced Brain Tumors Investigated

"Brain Tumors Induced in Mice by 9,10-dimethyl-1, 2-Benzanthracene," by L. Ya. Yablonskaya, Scientific Research Order of Labor Red Banner Institute of Neurosurgery imeni Academician N. N. Burdenko; Moscow, Voprosy Onkologii, No 8, 1960, pp 33-38

The purpose of this work was to obtain a biological model of a brain tumor on which the various problems of the etiology, pathogenesis, and experimental therapy of malignant neoplasms of the brain could be studied. Brain tumors were induced in black mice (lineage C_{57}) by 9,10-dimethyl-1, 2-benzanthracene. Of the 125 animals used in the experiments, 37 (33%) developed tumors having various histogenesis. Transplantable strains were obtained from ten of the primary malignant neoplams (5 strains of glioma, 4 of sarcoma and one of squamous cell cancer). The transplantability of the various strains varied between 80 and 100%, and during the passage process the percentage of the transplantability increased while the latent period decreased.

"On the Morphology and Pathogenesis of Brain Tumors in Mice Induced by 9, 10-Dimethyl-1, 2-Benzanthracene," by V. V. Arkhangelskiy, Order of Labor Red Banner Institute of Neurosurgery imeni Academician N. N. Burdenko; Moscow, Voprosy Onkologii, No 8, 1960, pp 38-48

Thirty five mouse brain tumors induced by 9, 10-dimethyl-1, 2-benzanthracene were studied to gain some understanding of some aspects of human brain tumors. A primary induced mouse tumor was shown to develop multifocally against a background of diffused proliferation of the local tissue close to the blastomogenic substance. Other factors concerning the pathogenisis of brain tumors in mice are also discussed.

Pharmacology and Toxicology

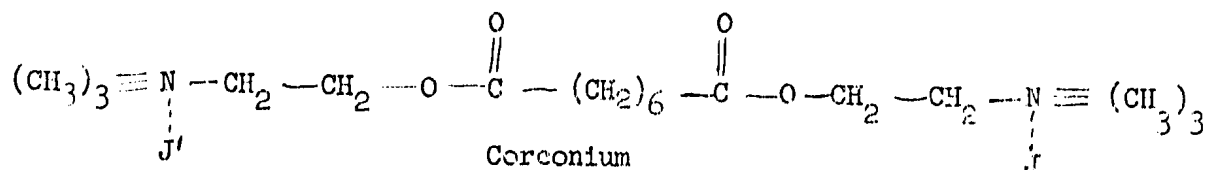116. New Method Proposed for Determining Cholinesterase Activity

"The Determination of the Activity of Acetylcholinesterase and Pseudocholinesterase in Small Blood Samples," by M. N. Linyuchev, Leningrad; Moscow, Voprosy Meditsinskoy Khimii, No 4, Jul/Aug 60, pp 427-430

Among the known methods of determining blood cholinesterase activity, the most suitable, from the practical standpoint, is the Pokrovskiy method which permits analysis on a mass scale without requiring numerous reagents, complex apparatus, or highly trained personel. In addition, this method permits a determination of cholinesterase activity with only a small quantity of blood which can be taken from the finger.

However, as in many others, Pokrovskiy's method only permits a determination of the total activity of blood cholinesterase (true and pseudo). Furthermore, there are indications that the inhibition and reduction of the activity of the enzyme begins first of all with the nonspecific (pseudo) cholinesterases, whose activity in human blood is less than the activity of true cholinesterase.

In connection with this the necessity arises for a differential determination of true and pseudo-cholinesterases which can be accomplished by adding a substrate to the reaction mixture which hydrolyzes either one of the cholinesterases.

The diiodide of the dicholine ester of suberic acid (D_6, coronium)

which is only slightly hydrolized by true cholinesterase was chosen as the selective substrate of pseudocholinesterase.

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$$(CH_3)_3 \equiv N - CH_2 - CH_2 - O - \overset{\overset{O}{\|}}{C} - (CH_2)_6 - \overset{\overset{O}{\|}}{C} - O - CH_2 - CH_2 - N \equiv (CH_3)_3$$

<div align="center">

J'   <u>Corconium</u>   J

</div>

According to this colorimetric method, one blood sample is tested for total activity (acetylcholineasterase plus pseudocholinesterase) with acetylocholine chloride while a parallel sample is tested for pseudo-cholinesterase activity with corconium. The difference, therefore, between the two activity tests gives the acetylcholinesterase activity.

117. <u>Investigation of Curare-Like Substances at Armenian Institute</u>

"Some Glycolic Esters of Dialkylaminoacetic and Propionic Acids," by A. L. Mndzhoyan, O. L. Mndzhoyan, and O. Ye. Gasparyan, Institute of Fine Organic Chemistry of Academy of Sciences Armenian SSR; Yerevan, <u>Izvestiya Akademii Nauk Armyansoy SSR,</u> Vol 12, No 6, 1959, pp 425-433

Dimethyl- and diethylamines were reacted with the glycolic esters of monochloroacetic and β-chloro- or β-bromopropionic acids to produce 28 previously undescribed glycolic esters of dialkyl-aminoacetic and propionic acids.

The ethylene-and butyleneglycolic esters of dialkylaminoacetic and propionic acids were prepared for comparative pharmacological testing as muscular relaxants. These investigations, were conducted in the pharmacological department of the above-named institute by G. A. Mednikyan.

Data from preliminary tests indicated that the most active compound in the series of iodomethylates of alkyleneglycolic esters of dimethyl-aminopropionic acid was the diiodomethylate of hexanediol ester of dimethylaminopropionic acid which in a dose of 0.01 mg/kg causes complete contraction of the gastrocnemius muscle of a cat in 30-40 minutes with the preservation of natural respiration.

110. <u>Toxicity of Hydrazine Hydrate Investigated</u>

"The Toxicological Properties of Hydrazine Hydrate," by Ye. I. Velling and A.A. Preobrazhenskaya: Moscow, <u>Gigiyena Truda i Professional'nyye Zabolevaniya,</u> No 8, Aug 60, pp 27-32

The problem of the toxicity of hydrazine hydrate ($N_2H_4 \cdot H_2O$) is of great practical value because of its extensive use in a number of industries (the rubber-engineering and metal fabricating industries, its use in the form of an insecticide and fungicide and as fuel for carburetor-type and

jet or rocket engines, etc.). Therefore, experimental investigations of the toxicity of hydrazine hydrate were undertaken. The investigations involved two types of animals -- rabbits (26) and white rats (80) -- and various routes of administration (inhalation, subcutaneous, percutaneous) under both acute and chronic conditions.

As a result of the investigation it was concluded that: (1) Hydrazine hydrate is a highly toxic substance possessing cumulative properties and characterized by resorptive and local action. (2) Blood changes in acute and chronic intoxication by hydrazine hydrate are in the form of hemolytic anemia. In the begining, however, there is an activation of hemopoiesis. (3) Chronic intoxication was observed in animals with concentrations of 0.0015 — 0.0009 mg/l permitting a recommendation of 0.00001 mg/l as a maximum permissible concentration for hydrazine hydrate.

119. Methods of Determining Hydrazine Contamination Invstigated

"The Determination of Hydrazine on the Fabric of Protective Clothing, Construction Material, and Skin Washings," by T. V. Solov'yeva, Institute of Labor Hygiene and Occupational Diseases; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, No 8, Aug 60, pp 51-53

Two methods of extracting hydrazine from the materials mentioned above were investigated: (1) an extraction method utilizing solvents, and (2) a desorbtion method using a stream of air. In the extraction method, best results were obtained by utilizing 30 ml of 0.1 N solution of HCl per 24 hr. Then, 5 ml of the solution was analyzed colorimetrically by using paradimethylaminobenzaldehyde. In the extraction method, best results were obtained by using air heated to 100° in amounts of 75-100 liters at the rate of 0.5-1 l/min. Results of the investigations involving both methods are presented in two tables.

120. Toxicological Tests for Determining Small Quantities of Thallium

"The Determinations of Small Quantities of Thallium in Biological Substrates (Blood, Urine)," by S. I. Murav'yeva; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, No 8, Aug 60, pp 53-54

A colorimetric method of detecting small quantities of thallium in blood and urine is described. Utilizing this method, it was shown that with the administration of 18 gamma in 10 ml of blood, 12-15 gamma (i.e., 66-83%) could be detected and that with the administration of 24 gamma, 18-21 gamma (i.e., 75-90%) could be detected. A table

presents percentage detection of various amounts up to 200 gamma in 200 ml
urine samples. The method developed will permit the detection of 60 gamma
of thallium in one ml of urine and 80 gamma in 100 ml of blood.

121. Thorium Toxicity

"On the Problem of Thorium Toxicity," by N. Yu. Tarasenko
(Moscow); Moscow, Gigiyena Truda i Professional'nyye
Zabolevaniya, Vol 4, No 6, Jun 60, pp 21-27

The toxicity of metallic thorium and its insoluble fluoride was
studied in two series of experiments: one in which metallic thorium and
its fluoride were administered intratracheally to rats, and the other in
which thorium fluoride was administered per os to rabbits. The experiments
established that thorium and its insoluble fluoride, when administered to
the animals intratracheally or by mouth produced changes in the organism
which were similar to those produced by radiation affections; the action
of thorium on the organism is accompanied by a number of organic and func-
tional modifications; changes of a destructive-dystrophic character occur
in the pulmonary organs, cerebrum, liver, and kidneys; the changes pro-
duced by metallic thorium in the renal, hepatic, and pulmonary organs, and
in the nervous system are analogous to those produced by the insoluble
thorium fluoride; this leads to the conclusion that it is the thorium
which is responsible for the pathological changes which take place in the
organism.

122. Zirconium Toxicity

"Investigation of the Toxicity of Zirconium and Its Compounds
Utilized in Modern Industry," by O. Ya. Mogilevskaya (Moscow),
First Moscow Order of Lenin Medical Institute imeni I. M.
Sechenov; Moscow, Gigiyena Truda i Professional'nyye Zabole-
vaniya, Vol 4, No 6, Jun 60, pp 27-31

In a series of experiments carried out to determine the toxic effect
of zirconium and its compounds on the organism, it was established that
metallic zirconium and zirconium dioxide, while not toxic in themselves,
form dust pockets in the lungs and induce fibrosis; the soluble salts of
zirconium (zirconium chloride, zirconium sulfate, and zirconium nitrate)
form highly aggressive aerosols, are generally toxic, and cause injury to
the tissues at the place of their penetration into the organism; the
intensity and character of their effect on tissue depend on their molecular
structure and solubility; special care must be used in work with these
metals, and workers handling them should undergo medical examinations at
least once a year.

123. Investigation of Indole Derivatives

"Synthesis of N-(d-β- Tetraacetylglucopyranozyl)-Indole," by
N. N. Surorov and M. I. Preobrazhenskaya, All-Union Scientific
Research Chemicopharmaceutical Institute imeni S. Ordzhonikidze;
Moscow, Zhurnal Obshchey Khimii, Vol 30, No 7, Jul 60, pp 2434-2435

Inasmuch as indole derivatives play an important role in the patho-
genesis of leucoses, the authors became interested in obtaining various
derivatives of indolylglucosides and studying their biological activity.

Indolin was reacted with glucose and later acetylated by acetic
anhydride in pyridine to form the intermediate product N-(d-β - tetra-
acetylglucopyranozyl)-indoline with a 60% yield. Dehydrogenation of the
last product with chloranil gave N-(d-β - tetraacetylglucopyranozyl)-
indole. Yield of the pure substance was 20-25%.

124. Chloracizine, New Vaso-Dilating Preparation

"Derivation of Chloracizine [the Hydrochloride of 10-(beta-
diethylaminopropionyl)-2-Chlorphenothiazine]," by A. N.
Gritsenko and S. V. Zhuravlev, Scientific Research Institute
Of Pharmacology and Chemotherapy, Academy of Medical
Sciences USSR; Moscow, Meditsinskaya Promyshlennost' SSSR
Vol 14, No 7, Jul 60, pp 25-27

The process of the derivation of the hydrochloride of 10-(beta-
diethylaminopropionyl)-2-chlorphenothiazine is described. The prepara-
tions ha been found to possess the property of selective dilation of
the coronary cardiac vessels. The preparation has been named Chloracizine
and is now being clinically tested for its possible application in the
therapy of cardiovascular diseases.

Physiology

125. <u>Ribonuclease, a Factor in Blood Pressure Regulation in Cats</u>

"On the Similarity of the Chemical Structure and Biological Activity of Ribonuclease and 'Inkrepan'," by S. V. Andreyev, R. P. Yevstigneyeva, A. M. Mirzakov, N. P. Sperankhaya, and N. A. Preobrazhenskiy, Moscow Institute of Fine Chemical Technology and Institute of Pharmacology and Chemotherapy of Academy of Medical Sciences USSR; Moscow, <u>Zhurnal Obshchey Khimii</u>, Vol 30, No 7, Jul 60, p 2433

On the basis of preliminary tests on cats where a more intensive hypotensive action of ribonuclease in comparison with Inkrepan and its protein fraction was observed, the authors believe that ribonuclease is an important biological factor for regulating the blood pressure level in man and animals.

126. <u>Effect of Some Drugs on Conditioned Reflex Activity</u>

"Effect of Pentaphen, Nicotine, and Arecoline and Their Iodomethylates on the Rapidity With Which Conditioned Reflexes Develop in White Mice," by N. Ya. Lukomskaya, <u>Fiziol. Rol' Atsetilkholina i Izyskaniye Novykh Lekarstv. Veshchestv</u> (The Physiological Role of Acetylcholine and the Search for New Medicinal Substances), L., 1957, 65-73 (from <u>Referativnyy Zhurnal -- Biologiya</u>, No 8, 25 Apr 60, Abstract No 37914, by V. S. Shashkcv)

"Pentaphen (10 milligrams per kilogram of body weight) retarded, and nicotine (50-200 gamma per kilogram of body weight) and arecoline (100 gamma per kilogram of body weight) hastened the development of motor protective conditioned reflexes induced by electrical stimulation in mice. The preparations were subcutaneously administered 15 minutes before the electric current was applied. The iodomethylates of the preparations had no effect on the rapidity with which the conditioned reflexes developed."

127. Effect of Some Preparations on Conditioned Reflexes

"Effect of Anticholinesterase and Cholinolytic Substances on the Rapidity With Which Conditioned Reflexes and Extinguishing and Differentiating Inhibition Develop," by N. V. Savateyev, V sb.: Fiziol. Rol' Atsetilkholina i Izyskaniye Novykh Lekarstv. Veshchestv (Volume on the Physiological Role of Acetylcholine and the Search for New Medicinal Substances), L., 1957, 49-53 (from Referativnyy Zhurnal -- Biologiya, No 8, 25 Apr 60, Abstract No 37910, by V. S. Shashkov)

"Phosphacol (0.1 milligram per kilogram of body weight) and proserine (0.1 milligram per kilogram of body weight) hastened, while atropine (5 milligrams per kilogram of body weight) retarded the development of motor food conditioned reflexes in mice. Analogous effects were exhibited by pentaphen (10 milligrams per kilogram of body weight) and arpenal (10 milligrams per kilogram of body weight). Phosphacol intensified differentiating and extinguishing inhibition, while atropine and pentaphen weakened it."

CPYRGHT

Public Health, Hygiene, and Sanitation

128. Dust Protection Masks

"Individual Means of Protection From Dust," by A. A. Toropov and P. G. Khabarov (Moscow), All-Union Scientific Research Institute of Labor Protection; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, Vol 4, No 7, Jul 60, p 62

Antidust respirators to protect workers from the harmful of dust particles not smaller than 0.1 microne are now being manufactured in mass quantities in the USSR. The respirators mentioned are PRB-5 and PN-21 manufactured at the Krasnogvardeyskiy Industrial Kombinat in Dnepropetrovsk, Ukrainian SSR; other respirators mentioned are F-46-K, RPP-47, and PRSH-2 (a respirator for miners). The respirators consist of two basic parts: a filtering section which contains the filters which purify the air, and a facial part which consist of semirubber mask which isolates the respiratory organs of the workers from the external environment.

129. Training of Sanitary Physicians

"The Training of Sanitary Physicians in Medical Institutes"
(unsigned article); Moscow, Sovetskoye Zdravookhraneniye,
No 7, Jul 60, pp 3-6

According to this article, facilities for training sanitary physicians
are now available in one special sanitary hygiene medical institute in
Leningrad and at 22 sanitary hygiene faculties of medical institutes. More
than 14,000 students are currently enrolled at these special sanitary hygiene
faculties of medical universities.

There were 25,300 physicians on duty in the sanitary epidemic control
establishments of the Ministry of Health USSR at the beginning of 1959.
The program for training sanitary physicians has taken into consideration
the long-range need for this type of personnel since 1957. The number of
students admitted each year for study at the sanitary hygiene faculties
throughout the USSR has been fixed at 1,600. This will result in an in-
crease in the number of sanitary physicians in the country under the
jurisdiction of the Ministry of Health USSR from 25,400 in 1958 [sic] to
36,000 in 1965.

Mass training of sanitary physicians in the USSR in special sanitary
hygiene faculties has been the most important task undertaken by medical
universities. It was brought about by great needs in the field of pre-
ventive medicine which required the organization of sanitary hygiene and
epidemic control establishments in the country.

Serious defects were found in the procedure and program of training
sanitary physicians. A decree was therefore promulgated by the Central
Committee CPSU and the Council of Ministers USSR on 14 January 1960. This
decree states explicitly that the Ministry of Health USSR must review the
current procedures and confirm new plans and programs for training sanitary
physicians to acquaint these physicians with sanitary hygiene problems
connected with the introduction of new technical processes into all important
branches of the national economy.

Reorganization of sanitary hygiene training will require changes in
the content of textbooks, which must be written especially for students
of sanitary hygiene faculties.

Sanitary-epidemiological stations must become fundamental components
of sanitary hygiene faculties. This is consistent with the law requiring
strengthening of the bond between education and life through the extensive
participation of students in socially useful work.

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<u>Radiology</u>

130. <u>Combined Antibiotic Therapy of Radiation Sickness</u>

"Combined Application of Bicillin, Dihydrostreptomycin, and Oxytetracycline in the Therapy of Radiation Sickness," by M. Ya. Chaykovskaya and G. Ye. Vaysberg, Radiological Division of State Scientific Research Roentgenoradiological Institute, Ministry of Health RSFSR, and Chair of Microbiology, Central Institute for Advanced Training of Physicians; Moscow, <u>Antibiotiki</u>, Vol 5, No 3, May Jun 60, pp 36-38

Dogs were used in experiments conducted to determine the effectiveness of combinations of bicillin, dihydrostreptomycin, and oxytetracycline when used in the therapy of radiation sickness induced in the animals by irradiation with 500 r. The antibiotics were administered to the animals as follows: bicillin and dihydrostreptomycin intramuscularly every 3 days in doses of 250,000 units each, and dihydrostreptomycin and oxytetracycline in doses of 250,000 units each during the intervals. The therapy continued for periods of 2-3 weeks. The results of the combined application of the antibiotics were positive: it resulted in a milder course of the sickness and prolonged the lives of the animals.

131. <u>Oxidative Deamination of Ethylamine Residues Key to Radioprotection of Substances</u>

"Concerning the Role of Oxidative Deamination in the Mechanism of Radioprotective Action of Certain Amines," P. G. Zherebchenko, Ye. S. Golovchinskaya, R. G. Kostyanovskiy, I. G. Krasnykh, Ye. I. Kuznets, O. Yu. Magidson, V. S. Murashova, I. S. Pastukhova, M. N. Preobrazhenskaya, N. N. Suvorov, L. S. Tervartanyan, K. A. Chkhinvadze, V. S. Shashkov, and M. N. Shchukina; Moscow, <u>Zhurnal Obshchey Biologii</u>, Vol 21, No 2, Mar/Apr 60, pp 157-159

Many investigators have called attention to the fact that the majority of known comparatively effective radioprotective substances (mercamine, tryptamine, serotonin, histamine, etc.) possess an aminoethyl residue, i.e., $R-CH_2-CH_2-NH_2$, where the R may be a mercapto group, an indole, a phenol, or an imidazole. Attempts to alter the aminoethyl group have resulted in either a decrease or complete loss of the radioprotective properties of the substances.

In the research described, the role of oxidative deamination as correlated to radiation protection and to the susceptibility of the amino group to attack by monoaminooxidase (MAO) was studied. Tests to assay the radioprotective action were based on the survival rate of mice irradiated by 700 r,

and treated by the intraperitoneal administration of various tryptamine compounds, phenylethylemine, mercamine, and tryptamine plus mercamine combined. Studies include data on the attack-susceptibility of the various well-known aminoethyl-containing chemical substances.

Results show that, in general, substances that do not deaminate do not possess any radioprotective effect. In the majority of cases, there is a satisfactory correlation between the attack-susceptibility of the substances to monoaminooxidase and the survival rate of the irradiated animals. Survival of irradiated mice was observed only in those cases in which substantially deaminating compounds were used. Inhibition of monoaminooxidase action by the addition of marsilide (isopropylhydrazine of isonicotinic acid) decreased or eliminated the radioprotective action of the substances. The combined administration of tryptamine and mercamine in small doses potentiated the protective action against radiation injury more than the total effect of each used separately. The authors attribute this potentiation to the creation of more favorable conditions for oxidative deamination in the presence of various enzyme systems.

132 a.   <u>Radiation Sickness Described</u>

"Radiation Sickness", by Dr. Gh. Petrescu; Bucharest <u>Pentru</u> <u>Apararea Patriei</u>, Aug 60, p 23

A one-page article in source describes radiation sickness, its effects on the body, and necessary treatments. The article describes the four stages of the acute type of radiation sickness, the chronic type, possible preventive measures, and medical treatment.

<center>Surgery</center>

132 b.   <u>Upper Portion of Cadaver Femur Successfully Transplanted to</u> <u>Living Patient</u>

"Homografts of the Articular End of the Femur Preserved by Refrigeration," by M. I. Panova; Moscow, <u>Eksperimental'naya</u> <u>Khirurgiya</u>, No 4, Jul/Aug 60, p 59

The following is the complete text of an article submitted for publication on 30 December 1955.

> "The successful clinical use of homografts of bone and cartilage has proved possible only recently, after the development and refinement of methods of tissue preservation by deep refrigeration.

"At the Laboratory of Tissue Preservation of the Central Institute of Traumatology and Orthopedics, bone and cartilage tissues are prepared from cadavers during the first 2-3 hours after the onset of sudden death under sterile operating conditions. The temperature regimen for the preservation is: rapid cooling to a temperature of -60°C for the first few days in a thermal chamber or with the aid of low-temperature containers using dry ice (carbon dioxide) at a temperature of -70 to -72°C. Prolonged preservation of bone and cartilage is accomplished in electric refrigerators at -20 to -30°C.

"This report concerns observations of the successful mass homotransplantation in the clinic of the upper articular end of the femur (the head of the femur with its cartilagenous coat, the neck of the femur, and the area of both trochanters together with the upper part of the femoral diaphysis) in a 16-year-old patient---T. The operation was performed because of a defect in the femoral head and neck which was accompanied by pathological dislocation of the femur due to epiphyseal osteomyelitis suffered in early childhood.

"The successful result of the homograft of the articular end of the femur in the case of the patient described above testifies to the possibility of more extensive utilization in clinical practice of homoplastic transplants of hemiarthroses preserved by deep refrigeration."

Miscellaneous

133. New Institute Being Established in Eastern Siberia

"Labor Hygiene Institute in Angarsk" (unsigned article); Moscow, Meditsinskiy Rabotnik, 20 Sep 60, p 3

A scientific research institute of labor hygiene, the first in Eastern Siberia, is being established in the young city of Angarsk. The laboratories and classroom are now being outfitted and a cadre is being selected. A collective from the Leningrad Institute of Labor Hygiene and Occupational Diseases will aid the Siberians in organizing this school and has already forwarded a scientific library to Angarsk. The main shipment of the latest type of equipment is being awaited from Czechoslovakia.

VII. PHYSICS

Nuclear Physics

134. Measurement of Absorbed Radiation

"Ionization Methods of Measuring the Energy Absorbed From a
Radiation Flux Consisting of Neutrons Mixed With Gamma-Rays,"
Yu. I. Bregadze, B. M. Isayev, V. A. Kvasov, Moscow, Atomnaya,
Energiya, Vol 9, No 2, Aug 60, pp 126-131

The possibilty of separate determination of the absorbed energy of
fast neutrons and of gamma-rays in the mixed radiation flux of the reactor
is studied by means of homogeneous ionization chambers. Three chambers
with various hydrogen contents were used: a polyethylene with ethylene
filling, a graphite with CO_2 filling, and a chamber of aerion, a conduct-
ing plastic mass, filled with a mixture of ethylene and CO_2. By using
theoretical computations an analysis of sensitivity of these chambers to
neutrons of various energies within limits of 0.2 to 8 Mev was carried out.
The variation of the neutron spectrum within wide limits does not effect
the accuracy of determination of the absorbed dosis in hydrogen-containing
substrata. As proved by computation, the error in determining the absorbed
energy from fast neutrons amounts to about 15% and depends little on the
ratio of neutrons to gamma rays doses.

135. Heterogeneous Reactor Theory

"Theory of a Heterogeneous Reactor Having Cylindrical Blocks
of Finite Radius," by A. D. Galanin; Moscow, Atomnaya Energiya,
Vol 9, No 2, Aug 60, pp 89-97

A conclusive theory of a heterogeneous reactor with cylindrical blocks
of a small, but finite radius, is developed. The density of thermal neutrons
inside the block and in the moderator is recorded by taking account the
azimuth relation. The diffusion theory is applied to the whole volume of
the reactor. Simple expressions were derived for the diffusion length in
parallel and perpendicular directions with an accuracy of the first power
of the ratio of block areas to the cell. It is shown that the mean scat-
tering length in the perpendicular direction depends on the shape of the
block. In Section 4, a simple method of obtaining the tensor of diffusion
is analyzed for the case of weak absorption and a long distance between
the blocks.

136. Beta Transitions

"Beta Transitions in Weakly Deformed Nuclei", by B. D. Konstantinov and V. I. Ovcharenko, Physics Institute, Academy of Sciences Ukrainian SSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 24, No 7, Jul 60, pp 912-919

Nuclear matrix elements were computed by making use of A. M. Korolev's work (ibid., 23, 1492 (1959)), where wave functions and energy levels of odd nuclei have been derived in an intermediate mode of bond by making an approach from the weak side of the bond. A computation of the nonadiabatic terms and two phonon states was also carried out.

137. Analysis of Stripping Reactions

"Excitation of Collective Nuclear Levels at Stripping Reactions," by A. M. Korolev, Physics Institute, Academy of Sciences Ukrainian SSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 24, No 7, Jul 60, pp 903-911

Some particular properties of stripping reactions were studied. A limiting case of intermediate bond was considered on the side of the weak bond, when the spectrum of collective oscillations has basically a vibrational character, while the original nucleus is spherical and the residual nucleus, after a neutron capture, becomes slightly deformed.

138. Inner Bremsstrahlung

"Inner Bremsstrahlung Accompanying Beta-Decay of P-32," by K. A. Korotkov and A. M. Chernikov, Voronezh State University; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 24, No 7, Jul 60, pp 899-903

A study of inner bremsstrahlung accompanying the beta-decay of P-32 was undertaken in the energy range of 20 to 1215 Kev to clarify divergent data. A one-channel scintillation spectrometer with a NaI (Tl) crystal was used for the measurements. The obtained experimental data did not concur with the corrected theory introducing the Coulomb effect in inner bremsstrahlung, although the divergence decreases at high energies.

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139. Transport of Radioactive Materials

"Chemical Stability of Deposits and Transport of Radioactive
Material in Water and Steam in a Water-Steam Loop in the
First Soviet Power Station," by P. N. Slyusarev, G. N. Ushakov,
O. V. Starkov, L. A. Kochetkov, L. N. Nesterova and V. Ya.
Kozlov; Moscow, Atomnaya Energiya, Vol 9, No 2, Aug 60,
pp 98-103

The reactor is investigated for evaluating the level of poisoning by
radioactive substances of the steam generated and guided to the turbine,
for the physicochemical properties of radioactive deposits and for the
possibilities of deactivation of inner surfaces of the pipe lines and the
turbine. The first power station was specially tested for the transport
of radioactive substances by steam and water in the loop mounted in the
first circuit of the power station. The deposit coefficient of substances
on the inner surfaces of pipe lines was determined, and the chemical
stability of the deposits was studied. Problems of deactivation of some
parts of the steam power circuit were studied.

140. Nuclear Power Reactor By-Products

"The "Radiative" Nuclear Reactor," by Yu. S. Ryabukhin
and A. Kh. Breger; Moscow, Atomnaya Energiya, Vol 9,
No 2, Aug 60, pp 132-133

The authors discuss possibilities of reducing the high cost of elec-
tric power generation by a nuclear reactor by gaining some by-products.
For this purpose a "radiative" reactor as a source of gamma radiation is
suggested. The best choice is offered by a reactor operating on 10 to 25%
enriched uranium with a graphite or beryllium moderator and liquid indium-
gallium as heat exchanger and gamma radiation carrier. A preliminary com-
putation evaluates the gamma radiation energy at 1.5% of the fission energy.

141. Reactor Design

"An Approximate Calculation of the Optimal Thermodynamic
Cycle for a Nuclear Power Reactor," by Yu. D. Arsen'yev
and Ye. K. Averin, Moscow, Atomnaya Energiya, Vol 9, No 2,
Aug 60, pp 133-134

Attempts to lower the costs of power generation by nuclear reactors
are analyzed. Criticism is voiced of computations by D. D. Kalafati
(Ibid., 8, No 1, 5 (1960); Teplotekhnika, No 3, 74 (1960) and others)
and some erratic derivation of formulas pointed out. Nevertheless the
work of Kafati is acknowledged to be of some limited value.

142. Geophysical Survey; Latvian Reactor

"Brief Communications" (unsigned item); Moscow, Atomnaya
Energiya, Vol 9, No 2, Aug 60, p 158

A seminar on instruments for geophysical surveying of wells by radio-
active methods was held in L'vov from 24 to 28 May 1960.

Ninety-five representatives of 35 organizations participated in the
seminar. Among the organizations represented were the Ukrainian Geophysical
Survey (Kiev), (Ukrgeofizrazvedka); All Union Scientific Research Institute
of Prospecting Geophysics (Leningrad); Institute of Nuclear Physics of the
Academy of Sciences Uzbek SSR (Tashkent); Moscow Affiliate of the Orgener-
gostroy Institute; Institute of Machine Studies and Automatics of the Acad-
emy of Sciences Ukrainian SSR (L'vov); Institute of the Petrochemical and
Gas Industry imeni Gubkin (Moscow); All Union Institute of Mineral Raw
Materials (Moscow); Institute of Nuclear Physics of the Academy of Sciences
Kazakh SSR (Alma-Ata); Volga-Caspian Affilate of the All Union Scientific-
Research Institute of Geophysics; Institute of Geophysics of the Ural
Affiliate, Academy of Sciences USSR (Sverdlevsk).

The laying of the foundation for the first research reactor in
Salaspils (Latvia) was held 26 May 1960. The officials attending, the
First Secretary of the Central Committee of the Latvian Communist Party,
A. Ya. Pel'gis, and the Deputy Chairman of the Council of Ministers of
the Republic, M. Ya. Pluden, in the traditional manner, deposited a steel
case in the base of the reactor with a memorial inscription and newspapers
dated 26 May 1960.

143. Targets for Nuclear Research

"Preparation of Targets From Isotopes for Nuclear Research,"
A. D. Bondar, A. S. Yemlyaninov, A. P. Klyucharev, L. G.
Lishenko, V. N. Medyanik, A. D. Nikolaychuk and C. Ye.
Shalayeva, Physicotechnical Institute, Academy of Sciences
Ukrainian SSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya
Fizicheskaya Vol 24, No 7, Jul 60, pp 929-933

The preparation of foils of 16 elements is described.

Three methods are applied: electrolytic deposit (Ni, Cu, Zn, Cd, Co,
Mn, Fe, Ag, Cr, Pb, Sn); evaporation in vacuum (Ge, Be); and thermal dis-
sociation for obtaining foils of Zr, Ti, and Cr by dissociating iodides
in vaccum.

144. A Magnetic Spectrometer

A Magnetic Spectrometer With Double Focusing," by A. S.
Deyneko, A. I. Popov, P. V. Sorokin and A. Ya. Taranov,
Kharkov Physicotechnical Institute, Academy of Sciences
Ukrainian SSR; Moscow, Izvestiya Akademii Nauk SSSR,
Seriya Fizicheskaya, Vol 24, No 7, Jul 60, pp 924-928

A magnetic spectrometer possessing double focusing is described, with
a magnetic field in the shape of a sector with flat edges. Focusing occurs
in a plane parallel to the field and in a plane perpendicular to the field.
The spectrometer is intended for study of nuclear reactions on an electro-
static accelerator.

Solid State Physics

145. Photoconductivity of Powderlike Semiconductors

"Investigation of Photoconductivity of Powderlike Semi-
conductors by Means of a Photoelectric Effect," by Ya. A.
Oksman and A. V. Burlakov; Moscow, Fizika Tverdogo Tela,
Vol 2, No 8, Aug 60, pp 1818-1828

Conditions contributing to a well-defined relation of photodielectric
effect to the photoconductivity of semiconducting powders, dispersed in a
dielectric, are analyzed. A method facilitating the determination of
phenomenological characteristics of photoconductivity under these circum-
stances is presented.

146. Semiconductors With an Extremum Loop

"Properties of Semiconductors With an Extremum Loop.
II. Magnetic Susceptibility in a Field Perpendicular
to the Plane of the Loop," by I. I. Boyko and E. I.
Rashba, Physics Institute, Academy of Sciences Ukrainian
SSR, Kiev; Moscow, Fizika Tverdogo Tela, Vol 2, No 8,
Aug 60, pp 1874-1883

The magnetic susceptibility of semiconductors with an extremum loop
is investigated in a field perpendicular to the plane of the loop. A
series of limiting formulas for the monotonous part of the susceptibility
was derived in presence and absence of degeneration of the electron gas.
The oscillations of the magnetic susceptibility were determined and their
peculiarities studied; they are related to the presence of a zone of neg-
ative effective mass and the existence of two close Fermi surfaces. This
last circumstance leads to the appearance of a characteristic picture of
beats. It is noted that such beats should occur in other crystals (in
compounds with metallic conductivity and in degenerated semiconductors)
without an inversion center.

147. Photodielectric Properties of Cadmium Selenide

"Photodielectric Properties of Polycrystalline Cadmium Selenide. I. High Temperatures." by Ya. A. Oksman and A. V. Burlakov; Moscow, Fizika Tverdogo Tela, Vol 2, No 8, Aug 60, pp 1884-1888

Photodielectric properties of powderlike cadmium selenide dispersed in a dielectric medium were studied at temperatures above room temperature and at frequencies not exceeding 200 kc. It is shown that in such conditions the photodielectric effect may be considered as an uncomplicated result of photoconductivity. By means of formerly developed analysis (Ibid., p 1818) the photoelectric properties of CdSe were determined and compared with data from literature.

148. Induced Infrared Photosensitivity

Induced Infrared Photosensitivity in Some Semiconductors," by Ye. N. Arkad'yeva and S. M. Ryvkin, Physicotechnical Institute Academy of Sciences USSR, Leningrad; Moscow, Fizika Tverdogo Tela, Vol 2, No 8, Aug 60, pp 1889-1890

Induced infrared photoconductivity, first detected in CdS at a temperature of 77°K by J. Lambe and C. C. Klick (Phys. Rev., 98, 4, 909 (1955)) has been studied. The same phenomenon was found in other semiconductors. e.g.. CdSe, CdTee, Sb_2Se_3. Typical curves of the spectral distributions of photoconductivity of these substances at 85°K are presented.

149. Magnetostrictive Oscillations

"Magnetostrictive Oscillations at High Exciting Induction," by L. N. Syrkin', Moscow, Fizika Tverdogo Tela, Vol 2, No 8, Aug 60, pp 1900-1908

By taking into account higher terms of the expansion of the magneto-elastic part of the thermodynamic potential of the ferromagnetic, formulas are obtained for computing tensor components of the dynamic magnetostrictive constant of the magnetopolarized medium taking into account the magneto-mechanical nonlinearity. The formulas are analyzed and methods are given for experimental check of the theory.

150. Photo Emission of Dye Layers

"Photoelectric Emission From Solid Layers of Pinacyanol
and Pinacryptol," by F. I. Vilesov and Academician A. N.
Terenin, Scientific Research Institute of Physics, Lenin-
grad State University imeni Zhdanov; Moscow, Doklady
Akademii Nauk, SSSR, Vol 134, No 1, Sep 60, pp 71-73

As continuation of the previous work by the authors (Ibid., 133,
No 5 (1960)) on the external photoeffect, the photoemission of thin
polycrystalline layers of pinacyanol, and pinacryptol, prepared by
deposition from alcohol solutions on nickel disks was studied. The
obtained data showed that the studied dyestuffs, while having close
values of photoelectric work function (5.2 and 4.9 e.v.) differ much
in values for distribution of photoelectrons according to energies.

151. Photodielectric Effect

"Negative Photodielectric Effect", by Ya. A. Oksman and
A. V. Burlakov; Moscow, Doklady Akademii Nauk SSSR, Vol 134,
No 1, Sep 60, pp 77-80

Stationary and relaxation laws of the photodielectric effect were
studied on cadmium selenide. At low temperatures properties of the
photodielectric effect were revealed, i.e., those due to localized
current carriers, as well as the negative photodielectric effect, i.e.
a decrease of active conductivity at optical excitation. It is possible
that at high concentrations of trapping centers the relaxation polariza-
tion is related to tunnel transitions of carriers without ejection into
the conducting zones. The negative photodielectric effect proves the
existence of relaxation polarization of current carriers localized on
shallow trapping levels.

Spectroscopy and Optics

152. Radiation of ZnS·Mn Phosphors

"Radiation Processes of ZnS·Mn Phosphors during Excitation
and Their Kinetics," by V. L. Levshin and V. F. Tunitskaya;
Moscow, Optika i Spektroskopiya, Vol 9, No 2, Aug 60, pp 223-
232

The effect of temperature on intensity of blue and orange phosphores-
cence of ZnS·Mn excited by light of 312 and 366 mmc wave length was studied.
The processes of conversion of excitation energy into blue phosphorescence,
manganese phosphorescence and heat were analyzed in relation to the tem-
perature of the test and manganese concentration. A schematic of develop-
ment of separate processes of phosphorescence and quenching is presented
with qualitative explanation of peculiarities of the observed phenomena.

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153. Particle Size Determination

"Determination of the Size of Particles by the Scattering
of Light," by I. Ya. Slonim; Moscow, Optika i Spektroskopiya,
Vol 9, No 2, Aug 60, pp 244-247

In previous reports by the author (Ibid., 8, 98, 243, 255 (1960))
nomograms were presented for computing the size of nearly spherical
particles from their light scattering. This method is extended to rod-
like particles, the length of which approaches the wave length of light
and which have a much smaller cross section.

154. Spectrovisor

"Spectrovisor," by M. M. Gurevich and K. I. Kolyadin;
Moscow, Optika i Spektroskopiya, Vol 9, No 2, Aug 60,
pp 253-256

A fast-working spectrophotometer of the visible spectrum is described.
It plots coefficients of spectral curves of transmission of test or stand-
ard specimens on the screen of a cathode ray tube. Each curve is recorded
in 0.01 sec. A movie camera permits fixing the optical part of the kinetics
of some chemical reactions.

155. Elementary Oscillators of Uranium Ions

"On the Nature of the Elementary Oscillators of Uranium
Ions," by P. P. Fecfilov; Moscow, Optika i Spektroskopiya,
Vol 8, No 6, Jun 60, pp 824-827

By employing the method of polarization diagrams, the nature of the
luminescence of elementary emitters formed by ions of hexavalent uranium
was determined. The uranium was introduced as an activator into crystals
of lithium fluoride. It was established that in addition to electrical
emitters, there are also magnetic dipole emitters in this phosphor which
are due to the presence of the uranium ions.

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